

SEPTEMBER 2003

MODEL **Airplane** NEWS

TAKE CONTROL!

Computer Radio Basics

Giant Golden-Age ARF
Super Kraft Monocoupe

FIRST LOOK!

RCV.58

Breakthrough Engine Design

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- > FV-1000—ducted-fan electric
- > Hawk—.30-size sport heli
- > Magic—3D fun-flyer



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MODEL Airplane NEWS

SEPTEMBER 2003 VOLUME 131, NUMBER 9

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ON THE COVER: the Super Kraft giant-scale Monocoupe is an exciting performer (photo by Deron Neblett). ON THIS PAGE: the F6F Hellcat from Giantscaleplanes.com (photo by Peter Abbe).

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The new schoolyard scale

It's no secret that we love scale planes, and until recently, the bigger they were, the better. But in the past year or two, a new breed of park and schoolyard-scale flyers has stolen our attention.

These small planes are usually easy to build and assemble, inexpensive (and use inexpensive radio and drive systems!) and are a heck of a lot of fun to fly anywhere there's an open space the size of a baseball field.

And last, these great little flyers *look* like "real" planes—right down to their panel lines and scale markings. Of the dozens of small electrics we've built and test-flown for reviews in *Model Airplane News* and our sister publication *Backyard Flyer*, a few models stand out from the rest, and we highlight 10 of them in this issue. Which schoolyard-scale

park flyers made the grade? Find out on page 28.

With their many-layered menus and multitude of switches and knobs, computer radios can seem mysterious. But these "bells and whistles" are actually great tools that can help your planes fly better—if you know how to use them! Unlocking the potential of your computer radio is easier than you may think. From dual rates to exponential, Rick Bell's "Program like a pro!" article on page 44 will give you an inside look at how to make your computer radio work for you.

In the workshop this month, contributor David Penschuk offers some insight into troubleshooting and diagnosing a "sick" gas-engine carburetor. He also offers some simple fixes to help overcome the airflow problems that cowed engines sometimes experience. See David's helpful tips on page 110.

You might be surprised by the small details that make a model plane stand out from the crowd. Even something as small as a spinner can make the difference between a showstopper and your average-Joe model. See page 104 for basic steps to a showroom shine for your spinner (or any other aluminum parts on your plane!). A little extra effort will go a long way toward making your model look good.

Giant-scale enthusiasts won't want to miss Gerry Yarrish's "Thinking Big" column this month. Let's face it; your next big bird "ain't goin' nowhere" without the right prop, and of course, it needs to be balanced properly. Gerry shares his big-blade advice and more on page 98.

75TH ANNIVERSARY

Model Airplane News will be proud to celebrate its 75th anniversary in 2004, and we'd like to include your memories in our commemorative January issue and throughout the year. Please drop us a line and share your favorite *Model Airplane News* article or column, or a special memory that you associate with the magazine. We look forward to hearing from you at man@airage.com, or by mail; write to "75th Anniversary," c/o Air Age Media, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

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Don Edberg, Dave Garwood, Dave Gierke, Henry Haffke,
Tom Hunt, Michael Lachowski, Andy Lennon, George Leu,
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MISTAKEN IDENTITY

Just received the new issue with Top Gun coverage—excellent photos, as usual. However, had I been privy to a copy of the cover as well, I might have been able to help avoid the mistaken identity. The T-34 shown on the August 2003 issue's cover is not a Top Gun entry; it is not Martin Hendrickson's aircraft. You might notice that there are no nose-gear doors and that it has exposed aileron horns, a screwed-on engine cowl, plastic wheels and tires and a smooth, MonoKote finish.

I am certain, however, that Top Flite and Great Planes will absolutely love you guys! This is a great picture of their sport-scale T-34 being flown for fun by David Pinegar. Martin's aircraft is quite a bit larger and has fully detailed scale landing gear along with scale riveting, panel lines, exhaust and a fully detailed cockpit interior.

FRANK TIANO, Lakeland, FL

Sorry for the mistaken identity, Frank, but ain't it a great shot? There were two yellow T-34s flying at Top Gun 2003, so I had a 50-50 chance



of correctly identifying our cover shot; no wonder I do so badly at Lotto! That O.S. carb sitting in the cowl inlet is also a definite giveaway that the

model wasn't Martin's Zenoah GT-80-powered, competition model.

GY

MAGIC CG FORMULA

Back in the April 2002 "Thinking Big" column, you showed a simple formula for balancing biplanes. Well, my flying buddy and I just finished test-flying a Fokker Dr.1 triplane, and your formula was right on! I applied the formula as if the model was a biplane, and I ignored the center wing. Your formula suggested that the plan's CG was off about 1 3/8 inches! As the triplane has a very short nose moment, I added 6 ounces of lead to balance it at the formula's new CG point. The result is a hands-off, stable airplane that is a joy to fly. We thank you again and suggest that you reprint the article in the future. [email]

DICK EIMERT

Dick, I have always been a big fan of the "Keep it simple, stupid" principle, and we've received several emails praising the simplified biplane-balancing formula and illustrations that were published in

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Fill nozzle controls
fuel flow.

To fuel tank

Do away
with sticky
fueler valves
permanently.

Threaded cap
for fueler

To engine

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"Thinking Big." Good job on your successful test-flight of that Fokker triplane. The last thing anyone needs is a tail-heavy model—especially if it's a scale, multi-wing design! GY

PAINT ON FILM QUESTION

I really enjoyed Rick Bell's article on painting ARFs in the July issue, and it has given me some ideas of my own. Your triplane sure did take on a new look with that unique paint scheme. I wonder, though: what will happen over time to the heat-shrink covering with the paint on it? Also, if the covering becomes wrinkled, can it be heated and shrunk with the paint on it? Keep the how-to articles coming! [email]

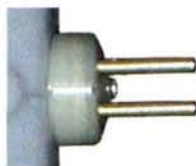
AARON HANSEMAN



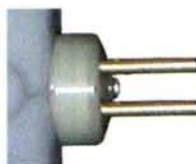
Thanks for the kind words, Aaron. I remember seeing the orange triplane poster many years ago and always thought it would make a cool model. Until Great Planes came out with its ARF model, I didn't think I'd ever build one.

To answer your questions: a little over a year ago, I gave the same treatment to an ARF Tiger Moth. I've flown the model a fair amount, and the covering has held up extremely well—in fact, better than if it hadn't been painted! Over time, very few wrinkles have shown up, and the covering seems to have kept more of its elasticity. You can heat the painted covering, but you must use a heat gun on a low or medium heat setting and keep the gun moving at all times. If you don't, you could burn the paint and ruin it. If you're contemplating a project like this, be sure to iron down all the seams thoroughly before you paint the covering, as you can't use a covering iron after the paint has been applied. Good luck with your project, Aaron, and send us a photo for "Pilots' Projects" when you're finished. RB

All Stopped Up.



Standard Glow Fuel Stopper Assembly Kit
with 1/8" Feed and Vent
Tubes
S482



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with 1/8" Feed and Vent
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S484



Oversize Glow Fuel Stopper Kit
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S479



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WE NEED YOUR HELP!

In 2004, *Model Airplane News* will commemorate its 75th anniversary! We're excited to celebrate this milestone, and we want to remember and give credit to all of the amazing modelers who have written for *Model Airplane News* over the past seven and a half decades. We know that you, our readers, made this 75th celebration possible, whether you've been reading since 1929 or last month! We hope that you'll take a moment to jot down your favorite *Model Airplane News* article or column, or even a special memory associated with the magazine, and email it to us at man@airage.com. You can also send it to "75th Anniversary," c/o *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. We hope to use as many of your recollections as space will allow in our special 75th Anniversary Edition in January 2004, and throughout the year. Thank you! ✦

AIR SCOOP

by the Model Airplane News crew

HANGAR 9

ARROW .40

With high-quality construction, Ultracote covering, an installed Evolution Trainer Power System and installed JR Quattro radio gear, this latest trainer from Hangar 9 is capable of bringing a new pilot from first flight to basic aerobatics! Because you need only bolt together its parts, the Arrow .40 can be flight-ready in less than 1 hour. Its Evolution Trainer Power System includes an engine that has been broken in and tuned, and the included 3-blade prop is designed to reduce airspeed to help novice pilots develop flight skills. There has never been a better time to learn to fly (or to teach that interested friend or neighbor!). Price has not yet been announced. Specs: wingspan—63 in.; wing area—710 sq. in.; length—52.5 in.; radio—JR Quattro (installed); engine—Evolution Trainer Power System (installed).

Hangar 9; distributed by Horizon Hobby Inc. (800) 338-4639; hangar-9.com.



SPORT FLYERS

AERO-PHIBIAN



Fly from land or sea with this unique sport plane—the first in a new, exclusive line from Hobby People. The Aero-Phibian comes with tricycle gear and floats that can be exchanged in minutes. It features

lightweight construction, iron-on covering, aluminum landing gear, floats (with steerable rudder), a fiberglass cowl and a complete hardware package, topped off with a detailed instruction manual. It's a steal for only \$149.99! Specs: wingspan—53 in.; wing area—530 sq. in.; length—43.5 in.; weight—5.1 to 5.75 lb.; wing loading—22 to 25 oz./sq. ft.; engine req'd—.40 to .52 2-stroke or .52 to .61 4-stroke; radio req'd—4-channel w/5 servos and Y-harness.

Sport Flyers; distributed by Hobby People (800) 854-8471; hobbypeople.net.

SUPERFLY R/C

SUPERFLY NITRO

This durable delta wing features strong, crash-resistant EPP construction and can be flown fast or very slowly. It can move like a fun-fly aircraft, track like a pattern plane and float down like a feather for landing. Whether you're in the market for a new combat model or just a fun sport plane, the SuperFly Nitro will fit the bill. The easy-to-build kit includes CNC-cut wing-cores, all necessary hardware and instructions. Specs: wingspan—30 in.; wing area—420 sq. in.; length—23 in.; weight—16 to 20 oz.; engine recommended—.061 w/Norvel extended tank; radio req'd—3-channel w/elevator mixing.

SuperFly R/C; superflyrc.com.

AIR FLAIR

IMPULSE ARC

A new addition to the Air Flair line of popular sport flying models is the almost-ready-to-cover (ARC) Impulse! The stylish, .40-size flyer is a smaller version of the 85-inch Impulse Plus kit and has a wingspan of 54 inches. It has a built-up wood fuselage and sheeted-foam wing construction. The kit comes with basic hardware items and a formed windshield, and it's simple to assemble.

Air Flair (317) 897-5551; airflair.com.



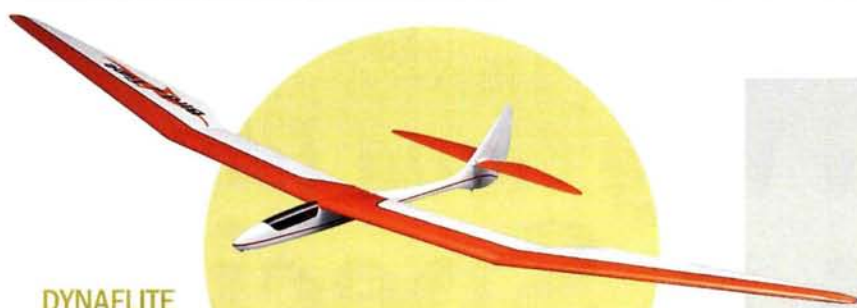


WATTAGE

Stearman EP BiPlane

WattAge has made quite a name for itself in the world of electric park flyers with its high-quality, great-performing aircraft, and this latest plane looks as though it lives up to the high standards we've come to expect from WattAge. This scale beauty features lightweight, one-piece wooden wings and wooden tail, a detailed, molded fuselage and a scale, simulated radial engine. It also comes with a powerful Speed 400 cobalt motor and micro hardware. We can't wait to get our hands on one! Specs: wingspan (top/bottom)—32.25/31.25 in.; total wing area—315 sq. in.; length—26.5 in.; weight—26 to 28 oz.; wing loading—12 to 13 oz./sq. ft.; motor—cobalt Speed 400 (included); radio req'd—4-channel.

WattAge; distributed by Global Hobby Distributors (714) 963-0329; globalhobby.com.



DYNAFLITE

BIRD OF TIME ARF

The great performance of this classic kit is now available in ARF form! With a hand-laid fiberglass fuselage with integral fin, built-up wooden three-piece wing and horizontal stabilizer and MonoKote covering, this Bird of Time can be flight-ready in as little as 2 to 3 hours. The model also offers several towhook locations and a spacious radio compartment that has room for a ballast box. The plane will cost just \$199.99. Specs: wingspan—117.5 in.; wing area—1,050 sq. in.; weight—3.75 lb.; wing loading—8.2 oz./sq. ft.; length—50 in.; radio req'd—2-channel w/one standard servo and one microservo.

Dynaflyte; distributed by Great Planes Model Distributors (800) 637-7660; dynaflyte.com.



SKYBORN ELECTRONICS

TNC SENSI-TACHS

This longtime favorite line of tachometers is now being produced by Skyborn Electronics! A good tachometer allows you to select the best prop for your application, properly set the fuel mixture and type and tune your engine for best performance. Because they have a built-in, high-gain amplifier and very sensitive photo transistor, TNC tachometers can read rpm several feet away from the prop, and they aren't affected by clouds or sun. They also use a temperature-compensated, crystal-controlled oscillator for timing, so they're incredibly accurate.

Skyborn Electronics (972) 267-5099; skybornelectronics.com.

HOUSE OF BALSA

MICRO ELECTRIC T-6 TEXAN

The first in a House of Balsa series of kits designed by Nick Ziroli, this little Texan is a straightforward build and an excellent flyer. The kit features laser-cut balsa and ply, full-size, CAD plans, Du-Bro hardware, plastic cowl, scoop and canopy, Mylar decals and photo-illustrated instruction manual. The kit retails for just \$69.95. Specs: wingspan—35.25 in.; length—24.25 in.; wing area—196 sq. in.; weight—21 oz.; wing loading—15.4 oz./sq. ft.; motor req'd—Speed 400; radio req'd—4-channel w/3 servos.

House of Balsa (760) 246-6462; houseofbalsa.com.



FUTABA

9C Radios with CAMPac Module

Now the popular, easy-to-program Futaba 9C FM and PCM 8-channel radios are available with a CAMPac module that allows fliers to expand the 9C's built-in, 8-model memory as well as to transfer model data from a PC. All 9C radios feature a unique dial-and-key method for finding and setting functions, and they come with endpoint adjustment on all channels; assignable switches and knobs; dual and triple rates; exponential; servo-reversing; throttle cut and idle-down and more. It uses a mouse for finding functions. All info shows up clearly on the large LCD screen. These special CAMPac-added 9C systems don't come with servos, so you can choose exactly what you need. Cost is between \$370 and \$470.

Futaba; distributed by Great Planes Model Distributors (800) 637-7660; futaba-rc.com.



AVIOMODELLI

ARIANE 5

This powered glider is a stable flyer and has good thermalling capability. It comes with a Duraflex fuselage, a sheeted-foam tail and two-piece wing, a transparent canopy and nylon-reinforced main gear. The Ariane 5 retails for \$239.99. Specs: wingspan—114.9 in.; length—50 in.; wing area—871 sq. in.; engine req'd—3.5 to 4.5cc 2-stroke or 6.5cc 4-stroke; radio req'd—4- to 6-channel.

Aviomodelli; distributed by Internet-RC Radio Control (602) 320-7114; internet-rc.com. ✦

HOBBY LOBBY

SPITFIRE MK-IX ARF

Relive the Battle of Britain in your backyard with this painted, molded-foam fighter. This scale electric is loaded with details, including vacuum-formed and painted radiators,



guns, exhaust stacks, air scoops and canopy. A detailed pilot figure is also included (you'll need to assemble and paint it). Installed ailerons and a pre-hinged tail are the icing on the cake. The plane comes with a 7.7:1 gearbox and a scale-looking, 4-blade prop; add

a Speed 300 motor, and the model will have more than enough get-up-and-go. Plug-in landing gear are included for display. Cost? Only \$129. Specs: wingspan—32 in.; length—27 in.; wing area—177 sq. in.; weight—14 oz.; motor req'd—Speed 300; radio req'd—3-channel.

Hobby Lobby (615) 373-1444; hobby-lobby.com.

MRC

SUPERBRAIN 969

Looking for a charger that can do it all? Check out the new Super Brain 969 peak charger/discharger. This unit can be plugged into a wall socket or hooked up to a field battery, and it works with 1- to 8-cell Ni-Cd, NiMH and lithium battery packs. With a selectable charge rate in 1/10A increments, selectable peak threshold, cool-touch construction and a cooling fan, this unit may be the last charger you'll ever need. It can even simultaneously charge or discharge two batteries of different voltages, so you spend less time waiting for batteries and more time in the air.

MRC (732) 225-2100; modelrectifier.com.



Illustrations by David Baker

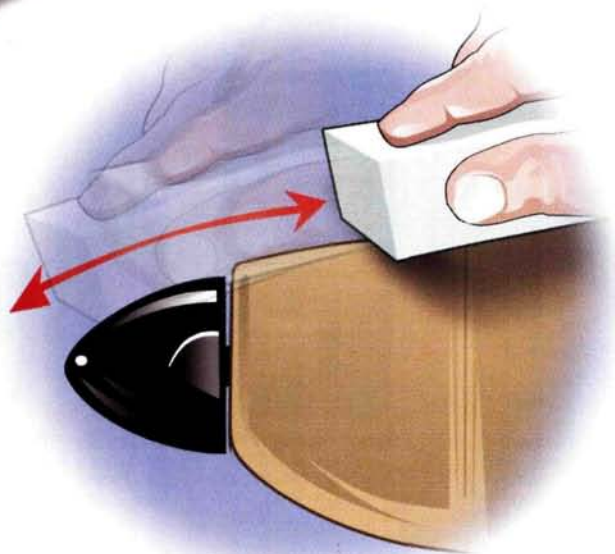
SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.



FREE SAWS

Don't throw away that aluminum-foil or plastic-wrap box when it's empty; the sharp cutting edge makes a great, free handsaw. Carefully remove the blade from the container and cut it to size with a rotary tool. Make a handle by cutting a slot in a dowel and securing the blade to the dowel with two screws. The saw will cut most woods and plastics, and you can make two or three saws from one blade.

Greg Mitchell, Harriman, TN



SHAPING UP

When your plane has flown its last flight (you know what that means!), save the spinner and its fittings. Use them when you shape the nose of your new plane instead of using a new spinner that can be scratched by the sandpaper. This will preserve your new spinner, and the front end of the fuselage will perfectly match it. Trade and swap spinners of different shapes and sizes with your flying buddies, and you'll soon acquire a collection for various models.

Stan Zdon, Coon Rapids, MN

EASY WHEELS

Need a pair of lightweight wheels for your park flyer? With a little work, large servo-output wheels will fill the bill! First, drill out the servo wheel's spline, and insert a piece of dowel of the appropriate size. A tight press-fit is more than adequate. To lighten the servo wheel, using the molded lines as a guide, drill a series of holes. Drill a small hole in the hub for the landing-gear wire, and your new wheels are ready to be installed.

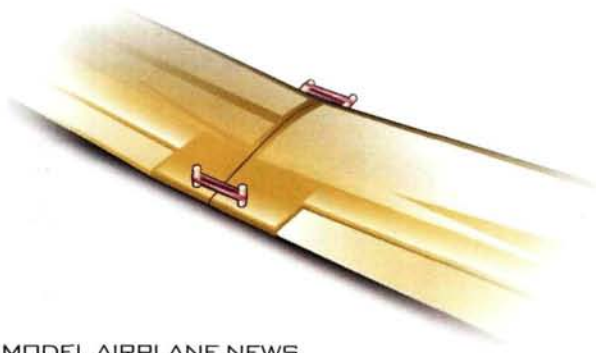
Alfred Krentz, Highland, CA



UNDER TENSION

It can be a challenge to join the wing panels of an ARF model, as there's no easy way to keep them aligned while the epoxy cures. Here's a simple solution: run dowels through the wing hold-down holes, and tightly wrap rubber bands around them (top and bottom). Also wrap rubber bands around the front wing dowels. The rubber bands apply tension and firmly hold the wing panels together as the glue dries.

Richard Rader, Bridgeport, WV



SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable but please do not send digital printouts. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.



DHC-2 BEAVER

Darren Gauthier, Victoria, British Columbia, Canada

Built from 1989 *Model Airplane News* plans, this 72-inch-span plane is powered by an Enya 50CX engine with a fully concealed, homemade muffler. Darren covered his model with Cub Yellow MonoKote and added floats from an old .40-size Pilot kit so that he could fly it from nearby Elk Lake in Victoria. A Futaba 6XAS radio controls the 8-pound plane.



XL-3 EXCELSIOR

Brian Bookwalter, Manhattan, KS

Tom Bookwalter sent us this photo of the 88-inch-span model that he and his son Brian (pictured) built from a Lairdair Aviation kit. The 21-pound plane is powered by a 3W 70I engine equipped with a smoke system, and it's covered with MonoKote. Tom notes that Brian has been flying RC since he was eight years old; we'll bet he has a lot of fun with this hot-rod!



FLAIR ME 110

Jean Tardif, St. Jean, Quebec, Canada

Built from a Flair kit, this model is covered in Solartex and weighs a little more than 5 pounds with two cobalt 15 motors and 16, 2400 Sanyo cells. Jean writes that his plane can fly for more than 10 minutes and that he reserves some "juice" for power-assisted landings. Nice-looking warbird, Jean.

PIPER PA 18 SUPER CUB

Mario Aldo Mastice, Neuquén, Argentina

With functional cockpit doors, operational flaps, a detailed instrument panel, two seats and scale landing gear, this Piper Cub is a real beauty. Mario designed and built the 81-inch-span model and powers it with a Saito .56 spinning a 12x6 prop. The 7-pound model is covered with Super MonoKote. Mario writes, "It flies great. With flaps, it takes off in 15 feet at 1/2 throttle."



OV-10 BRONCO

P.W.J. Smith, Sussex, England

When this modeler sees a plan he likes in a magazine such as *Model Airplane News*, he sits down with his pocket calculator and a ruler and scales it to the size he wants. In this case, he scaled Rich Uravitch's 80-inch-span Bronco to 40 inches. He powers his plane with two Speed 400 motors in Mini-Olympus gear drives. Mr. Smith, we applaud your ingenuity and creativity!



P-47 THUNDERBOLT

Terry Blankenship, Lumberton, TX

Terry built this model as a tribute to Maj. Glenn Eagleston, the pilot of the full-size warbird out of the Fighting Cobras in the 354th Fighter Group. The 63-inch-span plane started as a Top Flite Gold Edition kit to which Terry added a replica engine, a detailed cockpit and pilot, operational flaps, Spring Air retracts, two external drop tanks and Robart scale wheels. An O.S. 1.20 engine provides power, and MonoKote and Top Flite paint create the scale scheme. Terry adds that the 354th shot down more enemy aircraft than any other group—past or present.



FOKKER D-VII

Kenneth Daniel, Beckley, WV

Kenneth likes WW I models and built his Fokker D-VII from the popular Rich Uravich plan. It spans 49 inches and uses an O.S. .40 FP engine that Kenneth grabbed from his trainer. This is the second plane that he has built from a plan and his first venture into standoff scale. Kenneth says he likes the way the WW I fighter looks in the air when he does slow flybys. All he needs now is an S.E.5a on his tail!

FOKKER EINDECKER E.III

Marcelo Oga, Argentina

Designed for combat, this 1/12-scale warbird is the handiwork of Marcelo Oga and his son Juan (pictured). The model is powered by an O.S. .10 engine and uses a JR 652 radio, two sub-microservos and one microservo for control. The model is covered with Super Coverite. Marcelo writes, "Although the model has a small engine, it has excellent performance and is a bit fast!"



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BIG HOTS

Wilson Roque, Ocala, FL

Wilson ordered the plans for the Big Hots from *Model Airplane News* back in 1987, but he had to postpone the project. In January 2001, Wilson finally built the colorful, 20-pound model, which has a 90-inch wingspan and is 78 inches long. He used contest-grade balsa and plywood, and he covered it with Top Flite MonoKote in the colors of the Brazilian flag. He powers the plane with a Zenoah G-62 that turns a 24x10 APC prop. JR equipment is used throughout to fly the big aircraft. Wilson reports that the Big Hots flies extremely well. ✈



SCRATCH-BUILT UPROAR TWIN

Larry Kelley, Hoover, AL

How's this for different? Here, Larry's son Lee shows off their unique twin. After building several ARFs, they decided to build their first kit and first twin-powered model all at once. They started with two 60-size Uproars and a little imagination. With an 84-inch wingspan, the twin is 52.5 inches long and weighs 14 pounds. Two Thunder Tiger Pro .61s power it, and Spring Air retracts control the landing gear. Controlled by an Airtronics Vanguard radio, the model boasts a total of 11 servos. Very few modifications were needed to turn the Uproar kits into a one-of-a-kind model that flies great. Nice job, guys!

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THE NEW SCHOOL

Editors' top 10 picks

by the Model Airplane News crew

The performance of today's almost-ready-to-fly, electric-powered backyard flyers is impressive: power systems are well matched to the models, and the newer battery packs provide plenty of flight duration to satisfy even the most demanding park or backyard aviator. So what more can we ask for? Well, being the demanding bunch that we are, modelers want all this *and* a package that looks good doing its thing! Yep; it has to look scale, baby!

We've built and test-flown dozens of electric, schoolyard-scale park flyers—from built-up kits to film-covered ARFs to foams—for our product reviews in *Model Airplane News* and in our sister publication, *Backyard Flyer*. Though we liked 'em all, a few stand out above the rest. These sport-scale flyers not only look good, but they also fly as well as their bigger brothers. Which 10 are our favorites? Read on!



GWS P-51D Mustang

WINGSPAN: 34 in.

WEIGHT: 15 to 17 oz.

RADIO REQ'D: 4-channel w/3 microserves; 5-channel w/sub-microservo for optional retracts

MOTOR/PROP INCLUDED:

geared 370 motor and 10x8 prop

BATTERY USED: 6-cell, 600mAh Ni-Cd

FLIGHT DURATION: 5 to 6 min.

PRICE: \$59.99

PILOT'S LOG: the legendary P-51 Mustang is in a class all its own, and this backyard-flyer version does its big brother justice. The GWS P-51D features molded-foam construction that's easy to assemble. A lot of details have been molded into the plane's structure, and its gray-painted

base allows you to add decals to dress it up any way you'd like. The optional retracts are a really nice touch. (The plane is also available unpainted for \$49.99.)

Scale takeoffs and flight maneuvers are what this Mustang is all about. It flies inverted and does nice aileron rolls, too.

HIGHLIGHTS

- Easy to build.
- Fun to fly.
- Optional retracts.

GWS; distributed by Horizon Hobby Distributors (800) 338-4639; horizonhobby.com.

GWS Tiger Moth

WINGSPAN: 31.5 in.

WEIGHT: 7.6 to 9.7 oz.

RADIO REQ'D: 3-channel w/2 sub-microserves

MOTOR/PROP INCLUDED: GWS DX-A motor and 9x7 prop

BATTERY USED: 6-cell, 150mAh Ni-Cd and 7-cell, 300mAh NiMH

FLIGHT DURATION: 9 min. (150mAh Ni-Cd); 19 min.

(300mAh NiMH)

PRICE: \$54.99

PILOT'S LOG: this plane was one of the first scale, electric, park-flyer ARFs, and its great slow-flight characteristics and simple, appealing design fueled the popularity of small electrics. This plane's lightweight, molded-foam components help speed its assembly; the only tricky part is installing the wing struts. Although our review model came painted yellow and with roundel decals, it's also available unpainted for \$46.99. We've seen these planes dressed up in numerous scale schemes; the only limit is your creativity!

This plane is not only a vintage beauty, but it's also a fantastic flyer with stable, predictable performance in calm winds.

HIGHLIGHTS

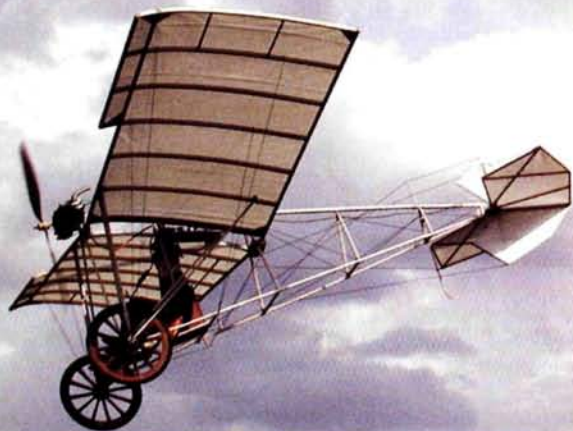
- Easy to build.
- Great flight performance.

GWS; distributed by Horizon Hobby Distributors (800) 338-4639; horizonhobby.com.

★ PARK-FLYER FAVORITE



OLYARD SCALE



Sig Mfg. Demoiselle

WINGSPAN: 43.5 in.
WEIGHT: 10.5 oz.
RADIO REQ'D: 3-channel w/2 servos
MOTOR/PROP USED: GWS IPS "B" motor and GWS 11x4.7 prop
BATTERY USED: 7-cell, 270mAh Ni-Cd
FLIGHT DURATION: 7 to 10 min.
PRICE: \$49.99

PILOT'S LOG: this awe-inspiring model attracts a crowd wherever it flies! Sig has done an excellent job with this unique subject.

The kit is complete; it includes all the rigging and covering as well as a vacuum-formed dummy engine.

The Demoiselle flies with a gentle grace that befits its elegant looks—very slow and smooth yet still sufficiently responsive to be flown in very tight areas.

HIGHLIGHTS

- Complete kit with high-quality materials.
- Nice handling characteristics.

Sig Mfg. (800) 247-5008; sigmfg.com.

WattAge Cub 400 EP

WINGSPAN: 46.5 in.
WEIGHT: 21 oz.
RADIO REQ'D: 3-channel w/2 microsensors
MOTOR/PROP USED: Speed 400 w/Gunther no. 302 (125x110mm) prop
BATTERY USED: 7-cell, 500mAh
FLIGHT DURATION: 5 min.
PRICE: \$89.99

PILOT'S LOG: what airplane enthusiast doesn't love a Cub? And this one's a dandy; it has lightweight, balsa-and-ply construction, iron-on film covering, a molded cowl and a complete hardware package. We especially like the Cub decals

for the tail and the scale-looking wing struts. Our reviewer added dummy engine-cylinder heads and landing-gear strut covers to enhance its scale appeal.

The WattAge Cub is also an impressive flyer that has forgiving flight characteristics. It can perform mild aerobatics just as well as its big brothers can!

HIGHLIGHTS

- High-quality construction and covering.
- Good parts fit and easy assembly.

WattAge; distributed by Global Hobby Distributors (714) 963-0133; globalhobby.com.



BATTERY USED: 7-cell, 600mAh Ni-Cd
FLIGHT DURATION: 10 to 12 min.
PRICE: \$89

PILOT'S LOG: the scale appeal of this little electric fighter is obvious; it wins high points for realism with its camouflage WW I scheme. Its molded foam fuselage and wings come painted; the included pilot figure does not. You can easily construct this model in three or four evenings.

With its large wheels, the Nieuport can take off from grass, and it can also handle moderate wind. This WW I classic is right at home doing any number of dogfight maneuvers.

HIGHLIGHTS

- High-quality parts.
- Excellent flight performance.

Hobby Lobby Intl. (615) 373-1444; hobby-lobby.com.



Hobby Lobby Intl. Nieuport 28

WINGSPAN: 32.75 in.
WEIGHT: 14.75 oz.
RADIO REQ'D: 3-channel w/2 microsensors
MOTOR/PROP INCLUDED: geared Speed 300 and APC 9x3.8 prop



WattAge F-86 Sabre Jet

WINGSPAN: 29.5 in.

WEIGHT: 20 oz.

RADIO REQ'D: 3-channel w/2 microservos

DRIVE SYSTEM INCLUDED: WattAge 400F motor and ducted-fan unit

Great Planes Spirit of St. Louis

WINGSPAN: 40.1 in.

WEIGHT: 11.5 oz.

RADIO REQ'D: 3-channel w/2 microservos

MOTOR/PROP INCLUDED: geared Speed 280

BATTERY USED: 8-cell, 150mAh Ni-Cd

FLIGHT DURATION: 5 min.

PRICE: \$89.99

PILOT'S LOG: we'll bet that Charles Lindbergh would have loved this micro version of his famous plane! With its painted, molded-foam fuselage and one-piece wing, the Spirit is a straightforward build, and it really shines in the scale accessories department: plastic replica radial engine, shock-absorbing landing gear, wing struts, foam wheels with hubcaps and decals are all included.

The plane is a stable flyer in light wind and responds well to control inputs. It's a pleasure to fly.

HIGHLIGHTS

- Fantastic scale looks.
- Flies well.

Great Planes (800) 637-7660; greatplanes.com.



BATTERY USED: 10-cell, 600mAh Ni-Cd

FLIGHT DURATION: 7 to 9 min.

PRICE: \$99.99

PILOT'S LOG: This "good guy" from the Cold War is ready to mix it up with an unsuspecting MiG! With a painted, molded-foam fuselage, wing and tail, WattAge's electric jet is very sturdy and an easy build. The plane even comes with two sets of decals so you have a choice of scale trim schemes! For added realism, our reviewer painted the plastic nosepiece instead of using the supplied decal.

This F-86 scoots right along and has more than enough power. It's also surprisingly stable. Low, high-speed passes look awesome!

HIGHLIGHTS

- Good flight performance.
- High-thrust fan unit included.

WattAge; distributed by Global Hobby Distributors (714) 963-0133; globalhobby.com.

★ BEST FLIGHT PERFORMANCE



WattAge Sukhoi SU-31

WINGSPAN: 29.5 in.

WEIGHT: 12 oz.

RADIO REQ'D: 4-channel w/3 microservos

MOTOR/PROP INCLUDED: geared Speed 370

BATTERY USED: 8-cell, 800mAh NiMH

FLIGHT DURATION: 5 to 7 min. (at full throttle)

PRICE: \$59.99

PILOT'S LOG: if you're looking for a high-performance show-stopper, the Sukhoi is your plane! The all-foam model comes almost completely built and with everything you'll need to get it into the air. The blue trim scheme is a nice touch that adds to its scale appearance.

The Sukhoi can perform very axial rolls, and its speed is impressive. Knife-edge, loops, snap rolls, spins and great vertical performance make this plane a winner!

HIGHLIGHTS

- Outstanding flight performance.
- Good scale appearance.

WattAge; distributed by Global Hobby Distributors (714) 963-0133; globalhobby.com.

★ FASTEST BUILD



Megatech P-51D Mustang

WINGSPAN: 32.75 in.

WEIGHT: 19.2 oz.

RADIO REQ'D: 3-channel w/2 micros (4-channel w/extra servo for aileron option)

MOTOR/PROP INCLUDED:

geared Speed 400 and 4-blade prop

BATTERY USED: 8-cell, 500mAh Ni-Cd

FLIGHT DURATION: 4 min.

PRICE: \$109

PILOT'S LOG: the fastest plane to assemble on our list of favorites (fast for any ARF!), the Megatech P-51D also scores high in durability. This fighter features a painted foam wing and a durable,

semi-flexible plastic fuselage. It's also available ready-to-fly with a radio and preinstalled servos, charger and 7-cell NiMH battery for \$249.

This plane is in its element on a low, high-speed flyby; after a good strafing run, it will pull out fast and regain its altitude. Landings are easy; just cut the throttle, and the P-51 glides down to the grass for a belly landing.

HIGHLIGHTS

- Incredibly fast assembly.
- Crash-resistant.

Megatech (201) 662-2800; megatech.com.

GWS A-10 Warthog

WINGSPAN: 38 in.

WEIGHT: 13.75 oz.

RADIO REQ'D: 4-channel w/3 micros

DRIVE SYSTEM INCLUDED:

two GWS EDF 50 ducted-fan units

BATTERY USED: 6-cell, 500mAh Ni-Cd

FLIGHT DURATION: 5 to 7 min.

PRICE: \$79.99

PILOT'S LOG: what's not to love about this incredibly cool military tankbuster? Nicely molded and detailed foam parts and included twin-fan units make this plane a great buy, and the included scale decals add

to its already scale military looks. It's also available unpainted for \$64.99; the plane shown here sports a custom airbrushed-camo scheme.

In the air, the A-10 climbs smoothly, and it's a fast, maneuverable model with outstanding handling.

HIGHLIGHTS

- High-quality, well-made parts.
- Realistic flight characteristics and great handling.

GWS; distributed by Horizon Hobby Inc. (800) 338-4639. ★

★ FAN FAVORITE



CHECK OUT THE COMPLETE REVIEWS OF THESE MODELS IN THE FOLLOWING BACK ISSUES:

Hobby Lobby Intl. Nieuport 28	Backyard Flyer, Summer 2002
Great Planes Spirit of St. Louis	Backyard Flyer, Winter 2003
GWS P-51D Mustang	Backyard Flyer, March 2002
GWS Tiger Moth	Backyard Flyer, Winter 2002
GWS A-10 Warthog	Model Airplane News, August 2003
Megatech P-51D Mustang	Backyard Flyer, May 2003
Sig Mfg. Demoiselle	Model Airplane News, March 2003
WattAge F-86 Sabre Jet	Backyard Flyer, Fall 2002
WattAge Sukhoi SU-31	Backyard Flyer, March 2002
WattAge Cub 400EP	Backyard Flyer, Winter 2002

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Throttle: proportional
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Stealth Target

The sleek Stealth fighter ground target is a great way to practice for the next big sortie or take on friends in a target shooting contest. It comes equipped with a sensor that registers hits from the Sonic Combat Module with a high-pitched tone. HBZ4025



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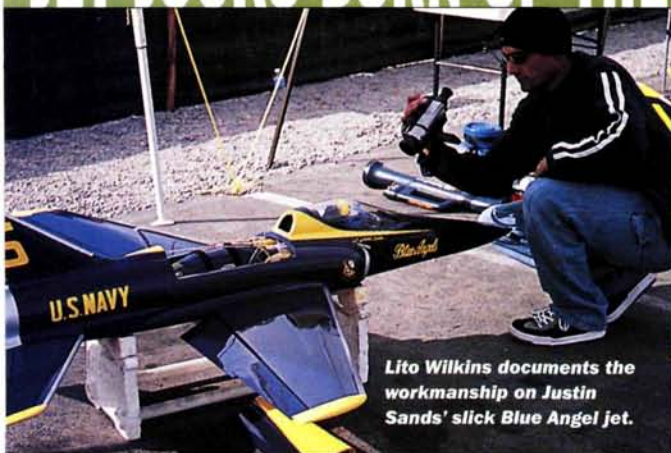


During the noontime jet lineup, the spectators got a chance to examine the planes first-hand before they marked their People's Choice award ballots. Thirty jets posed on the tarmac for everyone to enjoy.

DESTINY

by John Reid

JET JOCKS BURN UP THE SOUTHERN CALIFORNIA SKIES!



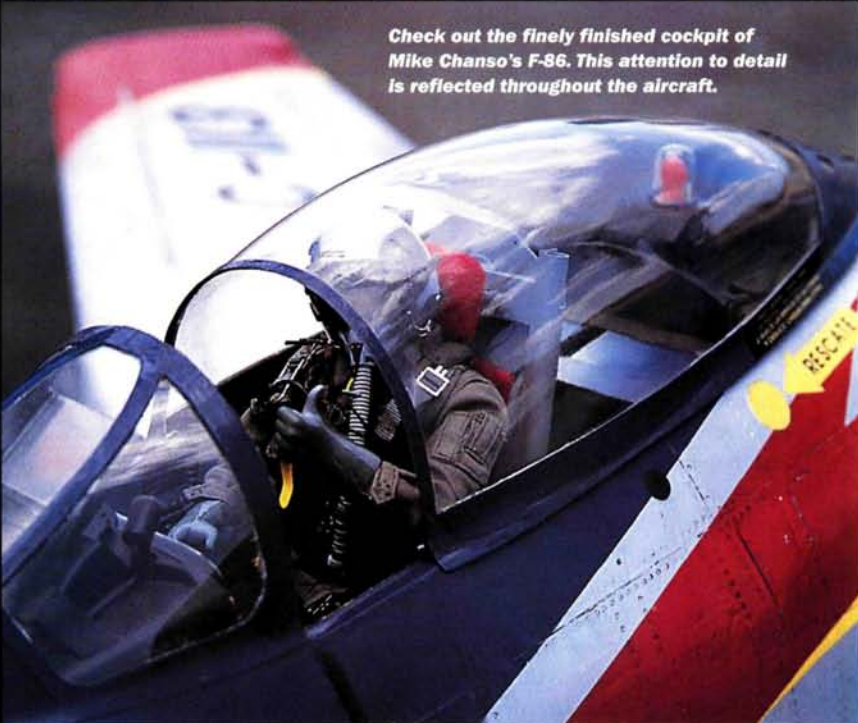
Lito Wilkins documents the workmanship on Justin Sands' slick Blue Angel jet.



Carl Goodhall's BVM MIG 15 makes a smooth landing just off the runway.

The day starts early as the pilots begin to assemble and double-check their planes from nose to tail, making sure that everything works smoothly and correctly. Soon, these planes will be cutting their way through the clouds at well more than 150mph. Each pilot knows that taking the time now to make certain that everything works right will ensure everyone's safety throughout the day.

As Prado Airpark fills with the hustle and bustle of spectators and vendors, jets begin to take to the sky—just a few at first, but by midmorning, the sky is swarming with thunderously roaring RC turbine-powered jets that wow the crowd with their low flybys. Welcome to the start of "The Best in the West"—the West Coast's premier RC jet event presented by the California Radio Control Jet Association.



Check out the finely finished cockpit of Mike Chanso's F-86. This attention to detail is reflected throughout the aircraft.

in the WEST

BEST IN THE WEST



Even the runway was crowded!



There was constant motion in the pit area as pilots assembled their planes and readied them for flight.

THE AIRFIELD

A first-class facility, the Prado Airpark in Chino, CA, is home to the Pomona Valley RC Flyers. The runway is approximately 800 feet long with a large, paved pit area, and for the occasional short or long landing, there is ample open space around the runway. This venue provides the perfect environment for the thousands of spectators who attend this four-day event. The 16 vendors had plenty of elbow room to set up shop, and there was a full-service food court as well. Prado Regional Parks and the local fire department both operated booths with games and prizes to entertain the younger crowd.

Many of the members of the Pomona Valley Flyers assisted with the logistics associated with putting on an event of this size by parking cars, helping out as needed and maintaining the facility for all four days.

THE EVENT

Fifty registered pilots attended The Best in the West this year. Pilots from all over California came, and they were joined by fellow fliers from Washington, Arizona, Colorado, Nevada and Oregon. This western gathering offers jet pilots a chance to meet and exchange building and flying tips, show off their expertly crafted performance aircraft and enjoy four days of flying. Each day, the jets streaked into the sky, performing high-speed passes, loops, rolls and picture-perfect landings to impress the judges. All the flying stopped at noon, and the planes were lined up on

the runway to provide spectators with a close-up view of these fine machines' craftsmanship as they marked their ballots for the People's Choice award. During the lunchtime break, the pilots and crowd enjoyed watching Joe McBride perform 3D aerobatics with a 38-percent Giles 30 ARF. Even before the noon break was over, pilots quickly launched their jets from the tarmac and continued to fly until the contest was officially over at 4 p.m. It's difficult to think of this as a contest because of the participants' casual attitude and camaraderie. All they did was smile as their richly detailed aircraft cut through the sky.

The Best in the West resembled a gathering of flying buddies more than a contest, and this made it very enjoyable for the registered pilots and spectators alike. Mike Sieniarski and his crew did a fine job of creating a relaxed atmosphere. Nevertheless, on the fourth day, awards were given out (it was a contest, after all), and many pilots had reason to beam with pride at their friends back in the pit area.

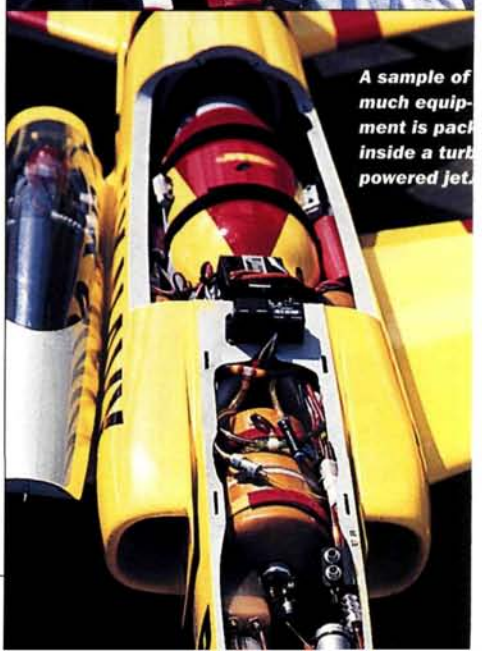
WRAP-UP

The Best in the West is a real treat for anyone who wants to see outstanding power performances and lots of great flying and who admires richly painted and detailed planes. There are also plenty of vendors who carry the latest in RC equipment. I'll be there next year, and I hope you will be, too. ✈



Left: Joe McBride at the controls of his Yellow Aircraft F-18.

Below: contest director Mike Sieniarski is interviewed by a camera crew from "Inside R/C." The Best in the West coverage will appear in a future episode.



A sample of much equipment is packed inside a turbo-powered jet.

BEST IN THE WEST



A brightly colored BVM Bandit touches down. Dan Avilla powers this ship with a 750+ RAm and maintains control with a Futaba 9Z radio.

A richly detailed F/A-18 makes a low flyby. Joe McBride really worked hard detailing this Yellow Aircraft kit.



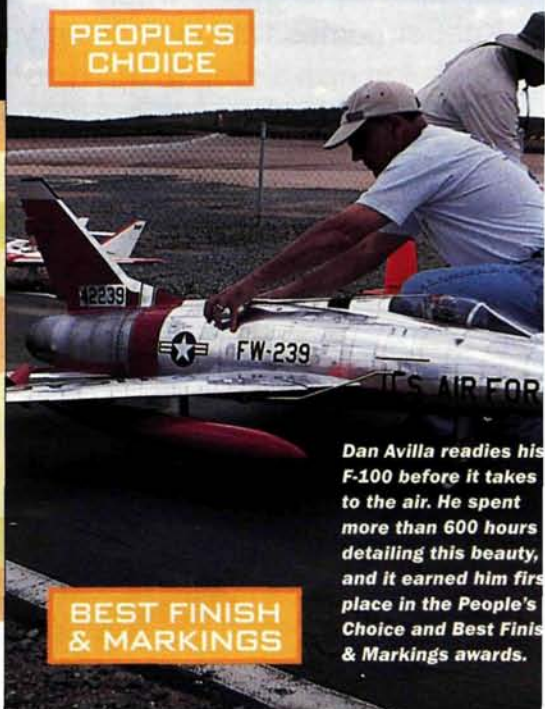
BEST SCALE FLIGHT



A very nice F-4J Phantom that Dave Fusinato built from a BVM kit. This 26-pound plane is powered by a Jet Cat P-120. Dave's handiwork earned him the Best Scale Flight award.

BY MIDMORNING, THE SKY IS SWARMING WITH THUNDEROUSLY ROARING RC TURBINE-POWERED JETS THAT WOW THE CROWD WITH THEIR LOW FLYBYS.

PEOPLE'S CHOICE




Dan Avilla readies his F-100 before it takes to the air. He spent more than 600 hours detailing this beauty, and it earned him first place in the People's Choice and Best Finish & Markings awards.

BEST FINISH & MARKINGS

AWARDS

Award	Sponsor	Pilot	Jet
Best Electric Jet	Electric Jet Factory	Edward Waldrop	A-10 Warthog
Best Ducted Fan	CA R/C Jet Assoc.	Nick Valoff	Starfire
Best Turbine Jet	Jet Cat USA	Sung Kim	A-37
Best Finish & Markings	Pro-Mark Graphics	Dan Avilla	F-100
Best Scale Flight	R/C Modeler magazine	Dave Fusinato	F-4
People's Choice	Powerflite	1st Dan Avilla	F-100
		2nd Sung Kim	A-37
		3rd Ken Le	F/A-18 Hornet
Pilot's Choice	BVM	Bill Brundle	Bobcat
Top Gun	JPO	Duff Waldron	F-15/Bandit

PROGRAM LIKE A PRO!



by Rick Bell

How do you set up dual rates? What is exponential, and why do you need it? How do you set up differential throw? These are just a few of the radio programming questions I often hear at the flying field about today's programmable computer radios. When I help pilots to program their radios, most are amazed by how simple it is to do, but the icing on the cake comes when they fly their models. Most pilots

instantly see the benefits of a programmable radio. For many modelers, programming a computer radio remains a mystery; they think they need a degree in computer programming or training in the "black arts" to work with them. Nothing could be further from the truth! Today's computer radios are very user-friendly and intuitive. Let's look at basic programming and how it can make your flying easier and more gratifying.

Continued on page 48



Computer radio basics



PHOTOS BY PETE HALL & JOHN REID

GETTING STARTED

The first question is usually "Where do I start?" The simple answer is: get intimate with your instruction manual. Grab your favorite beverage, sit in a comfortable chair, and read the manual from cover to cover. Don't let its length discourage you, as manuals usually include programming details for airplanes, helicopters and sailplanes, and these all have their own parameters. Review the different display modes and key functions on the transmitter face, and become familiar with the diagrams that show the names and locations of the switches and the knobs and buttons that may be new to you. It's also a good idea to keep the transmitter close at hand; you'll learn much faster if you find and use each function on the transmitter as you read about it. Most manuals have a "menu" flow chart that shows the functions available and their sequence in the transmitter. Having this menu handy provides a quick way to find the function you want. OK; now that you've studied the manual, let's move on to the functions that are most relevant to a standard, 4-channel, trainer/sport model.

■ Naming the program. Before you start to program, make sure that your servos and pushrods have been correctly installed, i.e., the servo arms are all centered, the trims are at neutral, sub-trim (if available, and sometimes referred to as "control centering") is set to zero, and the control surfaces are neutral. Radio programming can't make up for a bad base setup.

When I set up a new program for a model, the first thing I do is insert the model's name. Most computer radios can store several programs for a number of models. It's very important to name the programs to match your models; if you try to fly your model with the wrong program,

chances are, you'll crash. Before flying, always check the model name on the transmitter's screen; it could save you a lot of heartache.

■ Servo-reversing. Most servo locations are optimized for easy pushrod installation. A pushrod that has a straight run to its control surface will operate more smoothly and without binding. This also puts less strain on the servo and receiver battery and thereby increases their efficiency. After you've

servo's direction from normal to reverse. Aileron, elevator and throttle are set up in a similar way.

■ Servo travel. Endpoint adjustment (EPA), travel adjust and adjustable travel volume (ATV) are among the terms radio manufacturers use, but they all mean the same thing: being able to adjust how much the servo arm moves in each direction. This function is the "master," and its settings are carried through to all other functions.



With servo-reversing, servo location can be optimized with easy pushrod or pull/pull cable installations. In this example with an Airtronics RD8000 radio, a left rudder command makes the rudder move to the right. To reverse the rudder throw, simply access the servo-reversing function, scroll through until you reach the rudder (RU, on this screen) and then change from NOR to REV. The stick and control-surface movements will now match.

hooked up the pushrod to the servo and its control surface, check the control-surface movement to make sure that it matches the transmitter-stick movements. Using rudder to illustrate what I mean: move the rudder stick to the left, and the rudder should move likewise. If it doesn't, access the servo-reversing function, move the cursor to the rudder channel and change the

Example: say you're setting aileron throw: you set up the pushrods for the best mechanical advantage, and at 100 percent of servo travel, the ailerons move 1 inch above and below neutral, but you need only $\frac{3}{4}$ inch of throw above and below neutral. Reducing the percentage to, say, 75 percent on both sides of neutral will make the aileron move the required $\frac{3}{4}$ inch on both sides. This 75-percent number is now the new 100-percent travel recognized by all of the radio's other functions. Other channels that have ATV work in the same way. As you can see, ATV offers an easy way to set up the total amount of control throw.

■ Dual rates. Just by flicking a switch, you can use dual rates to reduce or increase servo travel to vary control-surface deflection. Most airplane setup instructions



Here's dual rate at work on elevator with a Hitec Eclipse 7 radio. Programming a dual rate is easy and enhances flying. Note the difference between the elevator's travel and the dual-rate switch's position. Use an up switch position for high rate and a down switch position for low rate.

include two sets of control throws—high rate and low rate—for aileron, elevator and rudder to increase or decrease sensitivity. Examples of when dual rates are useful are during aggressive aerobatics and during landing approaches when more control throw is needed.

Now, remembering that the ATV sets the maximum servo travel, you could use it (the ATV setting) as the high rate or set a new high rate and then set the low rate at 50 or 60 percent of that. Some radios have only individual dual-rate switches; others allow you to combine rates (aileron and elevator) and assign them to one switch. When setting up dual rates, I find it useful to make the up switch position the high rate and the down position the low rate; this makes it easy to remember which switch position does what.

■ **Exponential.** A lot of modelers misunderstand this function. Exponential (expo) works with dual rates, is usually programmed

If you decide to use expo, carefully check the radio's manual on how to set its percentages. Futaba uses minus percentages and JR uses positive percentages—just the opposite to achieve the same result. To get a feel for how expo works, program in a large percentage on, say, elevator, hold partial stick, and switch expo on and off. You'll see how it affects servo travel.

■ **Sub-trims.** Sometimes, when you install a servo arm, you can't center it exactly; this is where sub-trim comes in. It allows you to electronically fine-tune your servo centering. If you use sub-trim, do not use it to make excessive adjustments, as it isn't intended to take the place of proper mechanical trim adjustments. Excessive sub-trim will also create differential throw and make the servo travel greater in one direction than in the other. An unbalanced control response in which your model rolls faster to the left than to the right can result.



Sub-trim is used to center the servo arm electronically. In this example with a JR XP662 radio, note how the elevator servo arm is slightly off-center toward down-elevator. To correct this, access the sub-trim function and change the elevator value from "0" to "7" (for this example) to center the servo arm. Note that a "U" has appeared to denote that the servo has moved in the up-elevator direction.

on the same screen as dual rates and uses the same switches. Expo allows you to tailor the control sticks' response rate and is usually used to reduce sensitivity in the middle portion of the stick movement. An example of its use would be with a high-speed pylon racer: when it's flying at high speeds, small control inputs have large effects on the plane's flight path and make it look very jerky. With expo to soften the stick's response around neutral, the inputs aren't as great, and the plane flies more smoothly.

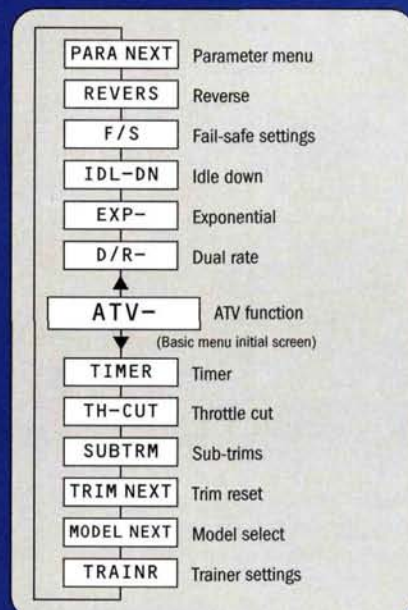
■ **Differential aileron.** On some models, downward aileron travel creates more drag than upward travel does. This phenomenon is known as adverse yaw, and it makes the model yaw in a direction that's the opposite of the aileron input. A right aileron input will bank the model to the right, and yet the nose points to the left—quite unnerving! Aileron differential programming can overcome adverse yaw by reducing the amount of down aileron throw.

To use differential programming,

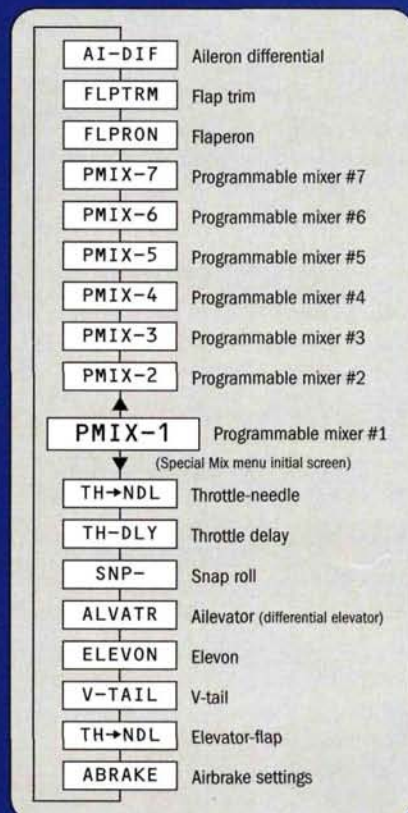
A MAP TO SUCCESS

Most computer radio manuals have a chart that illustrates the radio's functions and the sequence they follow. The more advanced radios usually have two menus—basic and advanced. The various applications ("acro," glider and helicopter) are divided in this way for ease of programming. Here's a typical computer-radio flow chart.

Acro Basic Menu



Acro Advanced Menu



GET WITH THE PROGRAM

A glossary of terms

Dual rates: two sets of control throws activated by a switch.

Exponential: describes servo movement with respect to stick movement; it's typically used to soften control response around neutral.

Differential throw: uneven movement in each direction of a control surface.

Flow chart: chart that shows the order in which programming functions should be set.

Sub-trim: function used to fine-tune a servo's center, or neutral, point.

Servo-reversing: used to reverse the direction of a servo's travel.

Adjustable travel volume (ATV): allows the servos' total travel in each direction to be set.

Percentage: programming values are given as a percentage of a whole, with 100 as the maximum value.

Servo travel: total servo-arm movement.

Adverse yaw: condition caused by aileron drag.

Mixing: a way of controlling two servos at one time with the flip of a switch on your transmitter.

Preprogrammed mix: used to cause a specific servo response of two servos defined by the radio's software.

Programmable mix: used to cause two servos to respond in specific ways, as defined by the pilot during radio setup.

Elevon: when two servos work together as ailerons and elevator; used on flying wings.

Flaperon: when two aileron servos operate both the ailerons and the flaps.



There are many possibilities for mixing functions in today's computer radios. In this example with a Futaba 9C radio, a mix of aileron to rudder (AILE→RUDD) has been programmed. Now, whenever the aileron is moved, the rudder also moves. This function is most useful for making coordinated turns. Note how left rudder is automatically applied with left aileron. The ratio of rudder to aileron is easily changed to suit the model. In this case, the RATE controls the ratio.

you'll need to use a servo for each aileron and to plug the servo leads into separate receiver ports; consult your radio's manual to find the proper ports. After you've programmed in a few percentages, test-fly the model, and adjust the percentages until it performs to your liking.

■ **Mixing.** Here's where a computer radio really shines—mixing! There are many ways to mix functions to reduce your workload. Most radios have two types of mixes: built-in preprogrammed mixes and programmable mixes. Flying wings, for example, can make use of a preprogrammed mix. Instead of using a complicated mechanical setup that requires a sliding tray and associated pushrods, just plug the aileron and elevator servos into the proper receiver ports, activate the elevon function, and the radio does the rest. Other programmed mixes that come to mind are those for flaperons, quad flaps, aileron to rudder, elevator to flap, rudder to aileron and V-tail.

Programmable mixes are among the most useful of computer-radio features, and they are used mostly to eliminate unwanted flight tendencies. Knife-edge flight is one use; you can program elevator and aileron

to correct unwanted pitching and rolling tendencies. Computer radios can have anywhere from none to five or more programmable mixes. Inexpensive radios usually have none or just one mix; high-end radios have many mixes for you to play with.

THE FINAL WORD

As you can see, programmable computer radios have a lot to offer us—everything from basic setup to advanced flight trimming. Today's radios can do it all. Though I've only scratched the surface here, this information should help you to start to get the most out of your radio. The best advice is to use the radio's features to understand them and then apply them to your particular need. You'll be surprised at what the radio can do for you. ✚

*Airtronics Inc. (714) 978-1895; airtronics.net.
Futaba Corp. of America; distributed by Great Planes (800) 637-7660; futaba-rc.com.
Hitec RCD (858) 748-6948; hitecrad.com.
JR; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

Produced from 1931 through 1940, the full-scale Monocoupe's beautiful lines and useful power-to-weight ratio made it one of the Golden Age's most sought-after aircraft. And I have no doubt that Super Kraft's faithful reproduction of its superior qualities will garner this $\frac{1}{4}$ -scale rendition just as much attention. It has been a long time since I enjoyed building an aircraft as much as I did this one. Its tremendous size and the top-shelf quality of its materials make the Monocoupe a keeper.



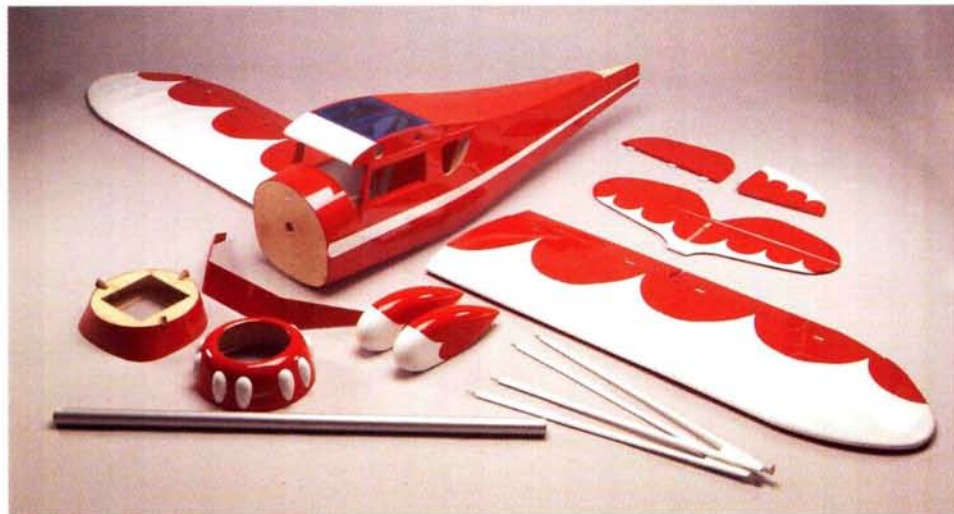
by Craig Trachten

SUPER KRAFT MONOCOUPÉ

$\frac{1}{4}$ -scale Golden Age favorite



PHOTOS BY ANDREW WEBBETT



Here's what I found when I opened the box; check out the beautiful, scale covering. Who wouldn't be impressed?

KIT COMPONENTS

The Super Kraft Monocoupe is an extremely well put together ARF. It comes completely built and covered in a beautiful scale pattern. The package includes all the necessary hardware, including landing gear, aluminum control horns and strut brackets—all of the highest quality. A fiberglass cowl and wheel pants and an excellent set of instructions and documentation round out this impressive package.

ASSEMBLY

• **Fuselage.** Assembly begins with the two-piece cowl, which consists of a cowl and a sub-cowl. Join the two pieces as instructed and put the assembly on your workbench. To determine how far the firewall should be from the engine's thrust washer, measure the height of the assembly from your workbench to the lip of the cowl and add 1/4 inch. When it's time to mount your engine and secure the cowl assembly to the aircraft, you will find that the two-piece cowl assembly makes one of the cleanest and easiest installations.

Because the fuselage is round, the main landing gear serves as a built-in work stand, so Super Kraft suggests that you mount it at this time. Simply attach the plate for the main landing gear to the fuselage and then the gear to the plate. The fitted, removable belly pan gives the model a nice, finished look and allows easy access to the aircraft's interior.

Now, it's decision time—gas or glow? Follow the instructions for whichever power system you choose. Because I had a Fuji 32 gas engine looking for a home, I went with gas. Though it's slightly over-powered, the

aircraft balances perfectly (I can always throttle back!). I cut a piece out of the lower firewall to allow clearance for the Fuji's rear-mounted muffler, but this does not affect the aircraft's structural integrity.

• **Tail feathers.** The installation of the horizontal and vertical stabilizers is about as standard as it gets. Just make sure that nothing shifts while the epoxy is curing.

Attach the flying-wire brackets as described in the instructions. The measure-



I told you this is a big plane, and I wasn't kidding. I had more room than I actually needed; this really helped to ease the assembly process.

ments given will help you to find the pre-drilled holes under the covering. Do not attach the flying wires at this time.

Some of the hinge slots in the control surfaces are a bit too small to accommodate the CA hinges. Simply enlarge them with a no. 11 hobby blade, and then center the hinges in their places and secure them with a little CA. Assemble and attach the tailwheel assembly as directed in the instructions.

The empennage controls are extremely easy to install. I was most impressed with the aluminum control horns. A single through-bolt with a finishing washer ensures an easy alignment and installation. The rudder pull/pull horn uses a one-piece stud that's inserted through the rudder; the

SPECIFICATIONS

MODEL: Monocoupe

MANUFACTURER: Super Kraft

DISTRIBUTOR: Kangke Industrial USA

TYPE: giant-scale ARF

LENGTH: 68 in.

WINGSPAN: 96.5 in.

WING AREA: 1,468 sq. in.

WEIGHT: 16 lb., 6 oz.

WING LOADING: 25.8 oz./sq. ft.

ENGINE REQ'D: .91 to 1.8 glow or gas

ENGINE USED: Fuji 32 gas

RADIO REQ'D: 5-channel w/7 servos (elevator, rudder, throttle, ailerons [2], flaps [2])

RADIO USED: Futaba 9CAP w/7 FMA PS500MBB servos

PROP USED: APC 18x8

PRICE: \$399.99

FEATURES: fiberglass cowl and wheel pants; complete set of high-quality hardware; beautifully covered in a scale pattern; scale accessories include landing gear and flying-wire brackets.

COMMENTS: this is not the first Super Kraft ARF that I have built, but I am always amazed by the superior quality of its models. Super Kraft kits are always well built and covered, the fiberglass components are always nicely finished, and the hardware is of the highest quality. The 1/4-scale Monocoupe certainly lives up to the company's glowing reputation.

HITS

- Top-quality materials and construction.
- Excellent hardware.
- Two-piece cowl/sub-cowl system.
- Great documentation.

MISSES

- Main landing gear is somewhat soft.

horns are then screwed onto the stud. I used the supplied wire to make the pull/pull cables for the rudder, but I used Dave Brown's fiberglass system for the elevator's "Y" pushrod. I used FMA PS500MBB servos for all of the control surfaces. At this point, you can attach the flying wires.

• **Power.** The Monocoupe's interior is large. I installed a 32-ounce Du-Bro gas tank in the nose and still had plenty of room to spare. To prevent the tank from moving around, I had to secure it in place.

When you mount your throttle servo, be sure that it is on the correct side for whichever engine you choose. Because I opted for the Fuji 32 gas engine, I mounted

A wise man once said, "When all else fails, follow the instructions." Since this is my first gas-powered aircraft, I did just that. Ignition switch off, choke on, prime until wet, switch on, hit the spinner with my electric starter and off we go. Just as the instructions promised! Before takeoff, I did a range test to make sure that there wasn't any radio interference.

TAKEOFF AND LANDING

The wind was blowing at between 15 and 25mph, so the first takeoff was without flaps. I slowly added throttle, and at about $\frac{1}{2}$ throttle and 35 feet, the Monocoupe was airborne. With the Fuji up front, the climb-out is quick and solid. I had to add down-elevator and right aileron trim for straight-and-level flight. From $\frac{1}{4}$ through $\frac{3}{4}$ throttle, the Monocoupe easily holds level flight.

Landing the Monocoupe is very easy. Because it tracks so solidly, you need only to line it up with the runway's centerline and manage throttle until touchdown. In the wind, I didn't have to use the flaps for landing, as the 'Coupe slows like a .40-size trainer. Just before touchdown on the first landing, a gust pushed the plane down rather hard onto the runway, and the aluminum gear splayed out. Fortunately, the wheel pants weren't damaged, and the gear was easily restored to its original shape.

LOW-SPEED PERFORMANCE

At $\frac{1}{4}$ throttle, I cruised around in a very true-to-scale way. The recommended control throws are right on, but be sure to use rudder for coordinated turns to prevent the model from skidding through them. I set up differential aileron throw as suggested in the instructions to minimize adverse yaw and didn't see any. "Stall" just isn't in the Monocoupe's repertoire. As I pulled the throttle back, it continued to float right along. The wind blowing over its large wing provided enough airspeed to keep it flying. When it does stall, it's anticlimactic: it just mushes along until its nose drops; adding power quickly has it flying again.

HIGH-SPEED PERFORMANCE

At full throttle, the Monocoupe is a well-mannered, groovy airplane—quite a surprise for a high-wing model. The Fuji gasser, though on the high end of the displacement range, is a good match for it and hauls it around at a good clip.



AEROBATICS

Can you say "graceful"? Though it isn't a pattern ship by any means, the 'Coupe can handle all but the most aggressive aerobatics. Rolls are surprisingly axial and majestic, but they do require properly timed rudder and elevator inputs. It loops like a roller-coaster; just pull back on the elevator, and around it goes. A stall turn is a thing of beauty: the rudder has plenty of power to make the model rotate on the wingtip. Nice! Point rolls, knife-edge and inverted flight are all within the model's capabilities and, like the rolls, require timed inputs for best results. This model is definitely a keeper!

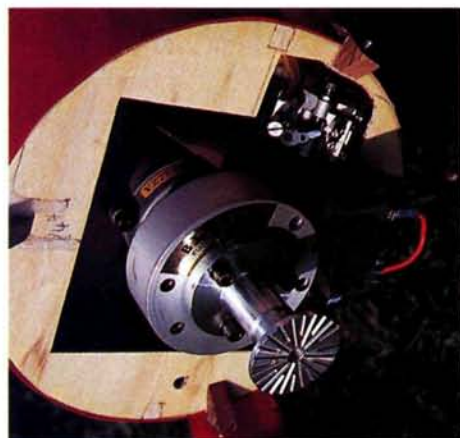
CONCLUSION

With this Monocoupe, Super Kraft continues its tradition of producing some of the highest-quality ARFs. Thanks to the topnotch materials used and ease with which the aircraft can be assembled, I enjoyed every step of this project—and that was before I even got it into the air! ✚

mine on the left and directly on the side of the cockpit wall to allow the pushrod to run directly to the engine.

Here is where the cowl is worth its weight in gold. Because all of the cutting had been done on the sub-cowl, I didn't have to cut, shape, or sand the outer finishing washer.

ilar problem with one of the wheel-pant fairings and I remedied this, too, with a little trimming. To complete the fuselage, trim and install the windows, the windshield and the top access plate. I installed several servo screws around the windshield to give it that riveted look, and I put one in the top plate



Though my Fuji 32 gas engine might seem like overkill for this plane, it balanced out perfectly. With just a few simple adjustments, the Monocoupe was easily able to accommodate it.



Tailpiece assembly was standard. I was impressed by the high quality of the hardware, especially the aluminum control horns.

With the cowl attached, none of the cutting is visible on the outer ring. A Dave Brown $3\frac{1}{4}$ -inch Vortech aluminum spinner—cut to accommodate an APC 18x8 prop—caps off the Fuji. Dave will cut a spinner for any prop you want to use.

• **Finishing.** Slide the body fairing over the landing-gear plate and glue it to the fuselage. I used JZ canopy glue for this. Once I had attached the fairings to the fuselage, it was difficult to take the bottom access belly pan off. To alleviate this problem, I simply trimmed the rear of the fairings. I had a sim-

(do not screw it down tightly) to serve as a hatch-opening handle.

The wing is assembled just like that of any other ARF. Here, too, the hinges required expansion. The outboard, aileron servos required extensions. I use heat-shrink tubing to secure the connections. The flap servo leads were long enough to reach the Y-connector.

Until the wing is mounted, the struts cannot be sized; attach them loosely to the wing, and once sized, they can be tightened down into place. A few words to the wise: stretch fuel tubing over the strut clevises to prevent them from falling off.

Dave Brown Products (513) 738-1576; dbproducts.com.

Du-Bro Products (800) 848-9411; dubro.com.

FMA Direct (800) 343-2934; (301) 668-7614; fmadirect.com.

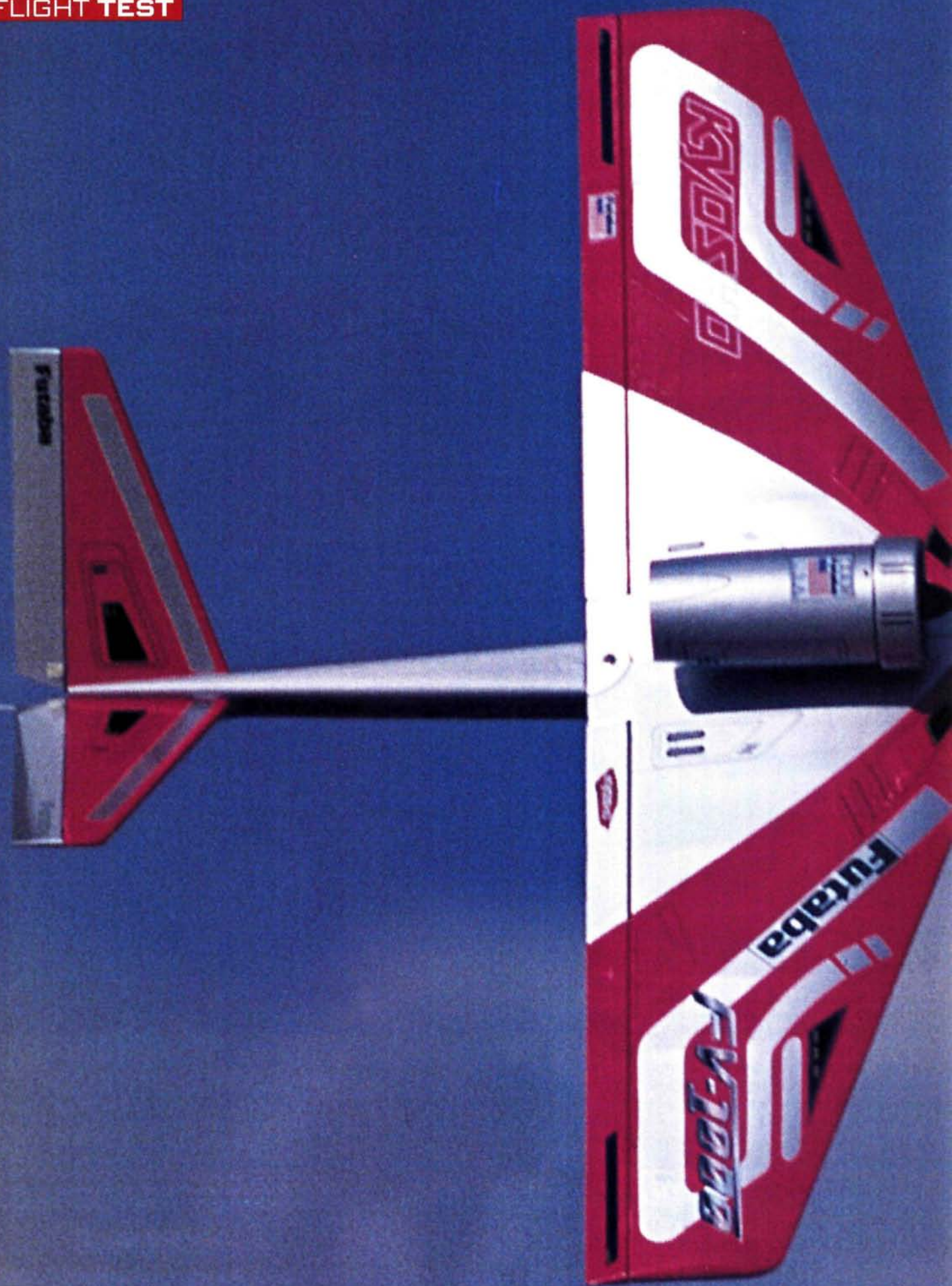
Fuji Engines; distributed by Great Planes; fujiengines.com.

Futaba Corp. of America; distributed by Great Planes; futaba-rc.com.

Great Planes Model Distributors (800) 637-7660; greatplanes.com.

J&Z Products (310) 539-2313.

Super Kraft; distributed by Kangke Industrial USA Inc. (877) 203-2377; (631) 274-3058; kangkeusa.com.



KYOSHO

FV-1000

Tear up the skies with this electric jet

by Mike Stroup

Looking for a space-age electric jet to tear up the skies with? Meet the Kyosho FV-1000. This V-tail, ducted-fan sport plane has plenty of power and a need for speed: fainthearted pilots need not apply. The FV-1000 features a gelcoated, fiberglass fuselage, built-up and covered wings and tail, pushrods, hardware and decals. The model also comes with a Kyosho ducted-fan unit and AP29L-V motor, which can produce almost a pound of thrust. Most of the building has been done for you, so it takes very little time and effort to put the plane together; you should be ready for the field in about an evening. The photos and diagrams in the instruction manual make assembly trouble-free.

Continued on page 60



PHOTOS BY JOHN REID

The World's Giant Scale War ***ZERO FIGHTER***

NO. A122



Highlights



Hand painted fiber glass fuselage with rivets and panel lines.
Balsa rib wing with hand-ironed on premium covering film.
Pre-hinged Functional flaps for smoother landing.
Pre-installed spring loaded mechanical retracts.
Pre-painted fiber glass cowling with 3D template.
Detachable 2-piece main wing, detachable stabilizer.
Hand painted canopy and detailed pilot.
Plastic spinner with aluminum alloy back plate.
Scale drop tank available (optional)



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ards



Almost-Ready-to-Fly



Plastic spinner with
aluminum alloy
back plate



Functional Flaps

SPECIFICATIONS

Wing Span: 80.0 in / 2030 mm

Wing Area: 1085 sq in / 70.0 sq dm

Flying Weight: 15.5 lb / 7100 g

Fuselage Length: 67.7 in / 1700mm

Engine Required: 2C 1.60 cu in

Radio Required: 6 channels, 9 servos

Pre-installed spring loaded
mechanical retracts



\$549.99

Pre-painted fiber
glass cowling with
3D template



Optional Drop Tank



Use a Dremel tool to cut out the battery-cooling inlets. I opened these holes as well as one for the on/off switch before I installed any radio equipment in the fuselage.

WING AND FUSELAGE ASSEMBLY

Start with the fan unit. I added some Loctite to the fan's main-shaft setscrew. It's important to tighten all the fasteners; you don't want any to come loose in flight! It's easier to put the decals on the fan unit now before you attach it to the wing.

The wing is next in line. CA the hinges, and then cut out the servo pocket and create the holes for the fan wires and the mount. Then install the fan-unit tray, alignment dowel and dihedral brace with epoxy. Finish the wing by installing the servo and then the fan unit. It's easier to install the servo before the fan unit because it's hard to work with the wing when it has a big "tube" on top.

The fuselage is next. In my kit, the front bulkhead was about 0.050 inch too wide, so I had to sand it a little to get it to fit properly. For good glue joints, be sure to sand the gelcoat off any areas to be glued inside the fuselage. I used a structured-tooth tungsten carbide bit in a Dremel tool to make the hole for the wing-alignment dowel. Its position isn't clearly marked on the fuselage, so start out a little low and work up (a slot instead of a hole is OK, as long as the top of the slot is in the correct location). Use the seam in the glass fuselage as the centerline. Epoxy the wing-bolt plate into place, line up the wing on the fuselage, and drill the hole for the single wing bolt. No rocket science here. Epoxy the aft bulkhead and the battery-compartment floor into place, and set the fuselage aside to cure.

TAIL ASSEMBLY

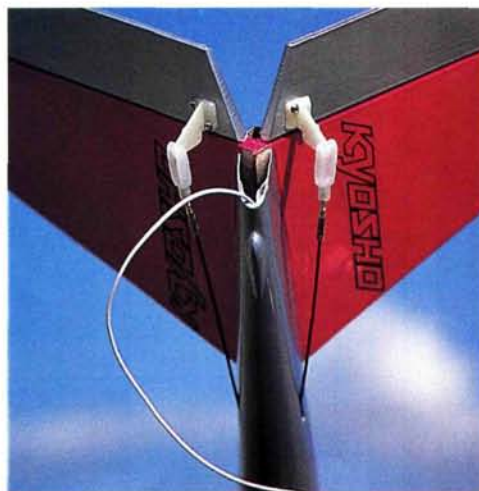
Before you continue with the fuselage, you need to assemble the V-tail. Install the CA hinges, epoxy the tail halves together with the provided wire dihedral braces (and angle template), remove the covering where the tail will be glued to the fuselage, and you've finished.

The next step is to epoxy the tail to the slot in the fuselage. The slot on my fuselage was not perfectly level, so I sanded the top of one side and the bottom of the other so the tail would be level with the wing. Be frugal with

the epoxy here and use it only where you need it; an ounce in the tail is 3 ounces in the nose! After the epoxy has cured, install the provided control horns. It's easier to drill out the holes in the horns for a proper clevis fit before you attach them to the control surfaces. Bend open the Y-pushrod to the indicated angle, and solder the threaded ends into place. I soldered after I had inserted the pushrod through the provided slots and into the fuselage and placed cardboard over the tails to prevent any spilled solder from melting through the covering. Screw the nylon clevis onto the threaded ends to approximately the mid adjustment point, and attach it to the outside hole on the horn.

Now it's time to install the tail servo. Follow the diagrams in the instruction booklet, and this is a snap. I used some servo-mounting tape in addition to the provided aluminum band. Make sure that the servo pushrod moves freely through the aft bulkhead.

I suggest that you cut out the battery-cooling inlets and switch-mounting holes at this point. This will eliminate the chance of damaging the radio components that would otherwise be inside the fuselage. I used a Dremel tool with the structured-tooth tungsten carbide bit to do this job.



The assembled tail fits into a slot in the fuselage; the servo for the elevator is mounted inside the fuselage.

SPECIFICATIONS

MODEL: FV-1000

MANUFACTURER: Kyosho

DISTRIBUTOR: Great Planes

TYPE: ARF electric-ducted-fan sport flyer

WINGSPAN: 39 in.

WING AREA: 341 sq. in.

LENGTH: 37 in.

WEIGHT: 2.7 lb.

WING LOADING: 18 oz./sq. ft.

POWER SYSTEM INCLUDED: APL29L-V motor and ducted-fan unit

RADIO REQ'D: 3-channel (elevator, aileron, throttle) w/2 servos

RADIO USED: Futaba 9ZAP with two Futaba S3002 miniservos and an AstroFlight 215D 30A ESC

BATTERY USED: 1700 and 2000mAh Sanyo Ni-Cd packs

FLIGHT DURATION: 4 to 5 min.

PRICE: \$150

FEATURES: gelcoated fiberglass fuselage; built-up and covered wing and tail; motor and ducted-fan unit; hardware and pushrods.

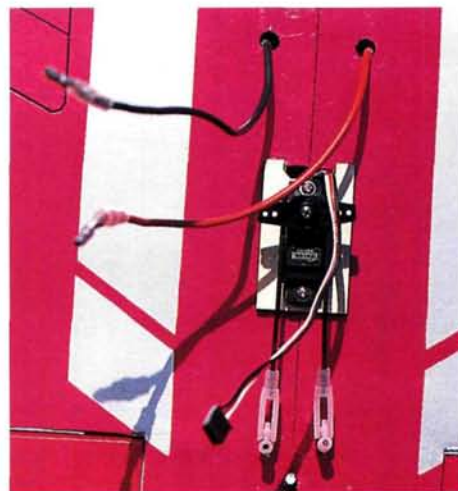
COMMENTS: the FV-1000's gelcoated fiberglass fuselage and built-up and covered wing and tail are well done and save a lot of time for the builder. This is a very complete package.

HITS

- Complete kit.
- Easy assembly.
- High-quality construction and covering.

MISSES

- None.



The aileron servo fits in this pocket on the underside of the wing.

TAKEOFF AND LANDING

Assume a position at the downwind side of the field, face the wind, apply full power to the fan, take a few running steps into the wind and **THROW!** Starting out at the downwind side of the field will allow the plane to climb out a bit before turning. Use minimum control inputs to keep the model in sight, and get it up to about 250 feet of altitude before you try anything aggressive. For most of the flight, stay at 80 to 100 percent power. When you have only 1 minute of good power left, begin to set up for a landing. Set up the landing as with any other plane, but carry at least 50 percent power until the plane is on final approach, and don't expect it to glide very far with the fan stopped. Keep the nose down about 10 degrees until flare. If you are ever forced to land this plane with completely exhausted batteries, land it like the space shuttle: nose down 30 degrees or so.

HIGH-SPEED PERFORMANCE

This plane is happier at high speeds. Its roll and pitch rates are manageable and predictable. As long as the power is kept up, the FV-1000 trades altitude for speed and speed for altitude fairly well. You'll typically need to dive to gain enough speed to perform a loop, but it will roll for days. Even at higher speeds, however, don't be a cowboy with the elevator, or it will snap!

LOW-SPEED PERFORMANCE

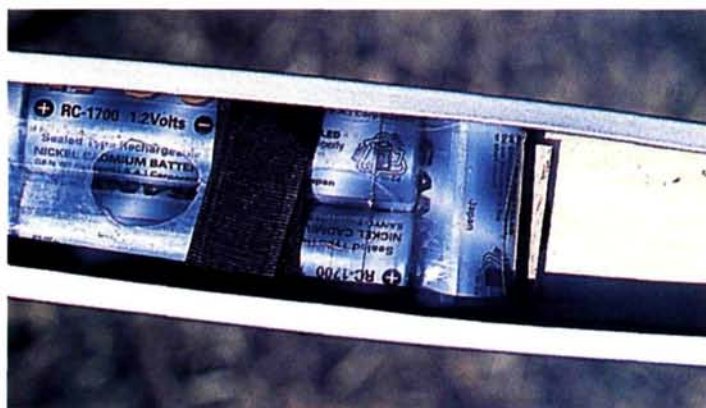
I don't recommend that this flight regime be used often; this plane needs speed! Only slow it down on final approach to landing and with a nose-down attitude. Be very gentle turning this plane at lower speeds or it may spin. If it stalls into a spin during slow flight, apply full power; you must get the speed back up before it will begin to fly. Early on, practice this kind of recovery at high altitudes and get a feel for how the plane turns at low speed.

AEROBATICS

With only elevator and aileron controls, you are a bit limited as to the types of maneuvers you can do. (Sorry; no knife-edge flight or stall turns.) But that isn't really much of a hin-



drance. If you want to fly pattern, get a pattern plane. If you want a space-age electric jet to tear up the skies with, this plane will do it. Inverted flight requires a fair amount of down-elevator, say 20-percent deflection with my setup. Typically, you must dive a bit to gain speed for any vertical maneuvers. I have done full-power dives from 400 feet and not felt I was at risk of flutter. Its rolls are fairly axial, but you will need to tap a bit of down-elevator when inverted to maintain altitude. Remember to be wary of the wingtip's stalling if you get too aggressive with the elevator!



The battery fits snugly and is held securely with hook-and-loop fastener. Note the tail servo; it's held with a metal bracket.



The supplied AP29L-V motor and ducted-fan unit provide plenty of thrust for 4- to 5-minute, high-speed flights.

RADIO INSTALLATION

Now you only need to install the rest of the radio equipment and secure the battery pack. I used hook-and-loop fastener to secure my receiver to the fuselage floor in the nose compartment to prevent it from moving around. Assemble the model with the switch harness, receiver and battery, and then bolt on the wing. Slide the battery around until you have the correct CG; then glue 1/4-inch hardwood blocks into place to prevent the battery from moving. Slide in the hook-and-loop fastener around the battery tray and the battery, and you've finished (except for the decals!). Be sure to set the control throws to those indicated.

I followed the decal scheme provided in the back of the booklet as closely as possible. The decals are of good quality and don't curl up when you remove the backing. I

used a small scrap piece of backing to hold each end of the decal to avoid transferring my fingerprints.

FLIGHT TEST

Before flying, it is a good idea to break in the motor. I ran it on 3, D-cell alkaline batteries for a few minutes to seat the brushes. Next, run the motor/battery system to gain some confidence and experience with the expected run time. I used 1700 and 2000mAh Ni-Cd packs and achieved 4 to 5 minutes of good power. After that, the power rapidly drops off. I'm looking forward to testing some NiMH packs for even longer flight times.

Now you have a completed FV-1000 at your favorite grass flying site, and the time has come! The CG is correct, the control direction and throws are correct. Take your

model and do a few mock throws. Don't be shy; really apply some effort here, but don't let go! This exercise will verify that nothing will slip around in the fuselage and upset the CG when you hand-launch the model.

CONCLUSION

The Kyosho FV-1000 is a really economical way to get into a jet; at around \$150 for everything except radio gear and batteries, it's a clear bargain over glow-powered ducted-fan models. It's easy to assemble, and it's a lot of fun to fly as long as you keep its speed up. Enjoy! ✚

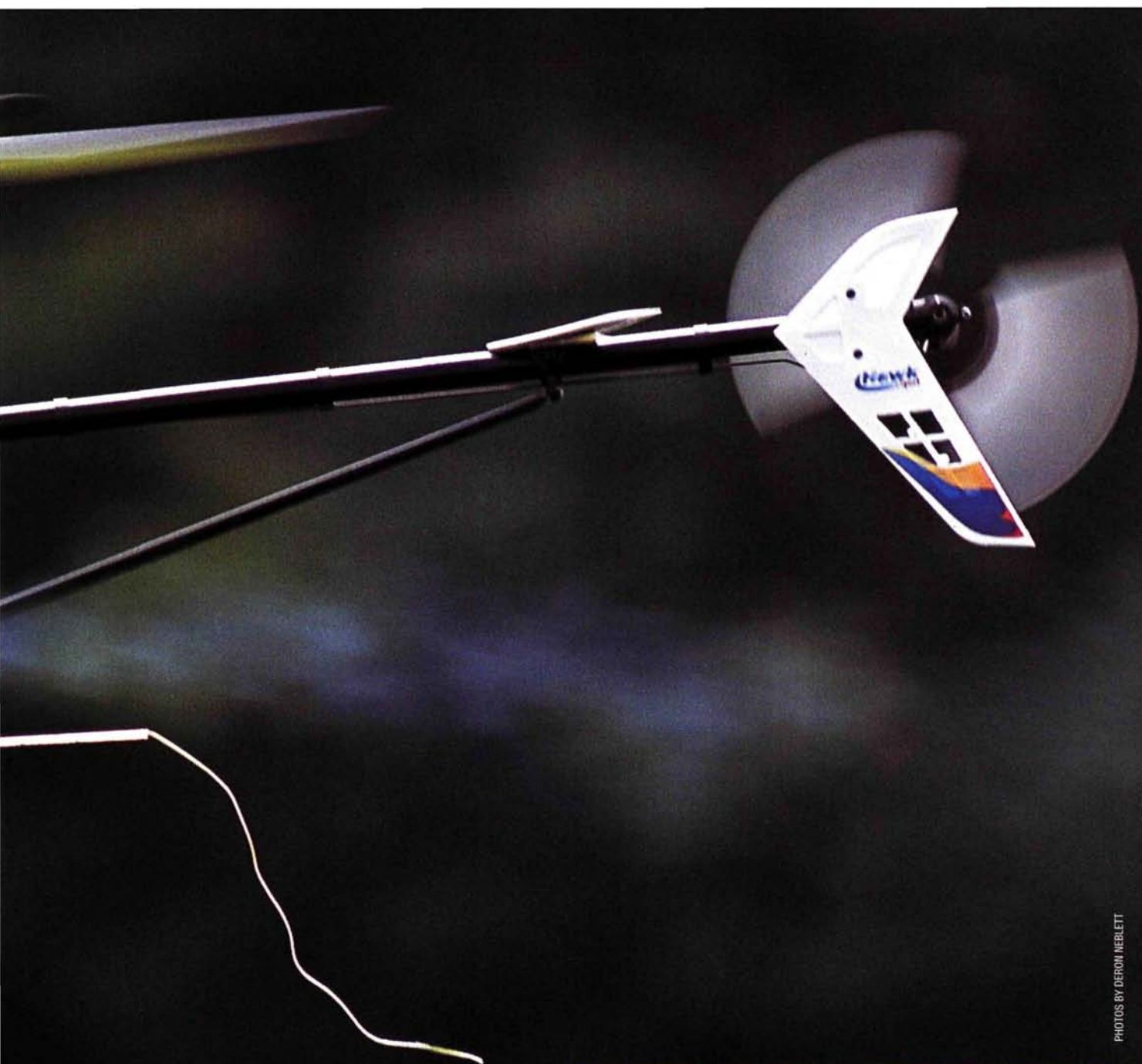
Kyosho; distributed by Great Planes Model Distributors (800) 637-7660; kyosho.com.

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CENTURY HELICOPTER PRODUCTS

HAWK SPORT



PHOTOS BY DERON NEBLETT

This bird rocks!

by Erick Royer



Being a helicopter enthusiast, I've read many heli discussions on the Internet, and two major questions are always asked: "What is the best, low-cost, radio-control helicopter for the beginner?" and "Is there a good helicopter for practicing 3D aerobatics?" As with the old Ford-versus-Chevy controversy, the answers, of course, will vary greatly depending on whom you ask. Century Helicopter Products introduces its new Hawk Sport ARF that fills both needs: a low-cost heli for beginners and seasoned pilots alike. The Hawk Sport is an inexpensive 30-size helicopter that comes as an almost-ready-to-fly (ARF) kit. But don't let the word "inexpensive" fool you: this heli has many features that make it an excellent 3D trainer as well. The Hawk Sport contains 31 ball bearings for smooth operation, and with its many built subassemblies, it can easily go from box to field in a few short hours. The main mechanics, rotor head and tail gearbox are already built; even the pushrods are preassembled.



As you can see, all of the major assemblies are built and ready for installation. The helicopter's modular chassis can be assembled and maintained easily.

WHAT'S IN THE BOX?

The Hawk Sport comes in a "quick-build format." Each subassembly is packed separately with all the required hardware to complete it. The main frame comes with the main shaft, swashplate, washout unit, starter shaft, main gear and fuel tank already installed. The rotor head and tail-rotor gear-box and tail boom with the pushrod guides are also assembled for you. The polypropylene-plastic canopy is virtually indestructible. The kit includes a set of covered and balanced Aerotech 550mm main blades; only the root reinforcements need to be attached. An attractive set of decals is also included to dress up the canopy and tail feathers. The kit also comes with a high-performance muffler.

The Hawk Sport boasts many high-end features not usually found on a .30-size helicopter, such as: strong rigid frames molded from a fiber-filled composite material; modular frame design for easy assembly and maintenance; the clutch, clutch bell and fan are all mounted on the engine's crankshaft and don't require alignment. The top hex-start

system disengages when the engine is running; this eliminates a significant source of vibration. The large, 10-ounce fuel tank is just behind the main shaft near the center of gravity (CG); this ensures minimal CG changes as the tank empties. The cooling shroud completely covers the engine head, thereby optimizing engine cooling. Metal control balls are used for all control connections—no Z-bends here! Wow! That's a lot of heli for less than \$160.

ASSEMBLY

The Hawk Sport comes with two manuals—the quick-build guide and a full assembly manual. Even though the Hawk Sport is an ARF, it's still necessary to refer to the full manual for construction notes, screw sizes, etc. Century's manual is excellent: lots of detailed pictures and illustrations and accurate text.

Start by attaching the clutch bell, clutch and cooling fan to the engine. This is simple; just be sure to use thread-lock where indicated. I removed the throttle arm from my



The servo layout is very straightforward and out in the open. This makes for easy assembly and adjustments. Note the tidy radio installation.

SPECIFICATIONS

Model: Hawk Sport

Type: .30-size collective-pitch helicopter

Manufacturer: Century Helicopter Products

Rotor diameter: 49.5 in.

Length: 46 in.

Height: 16.2 in.

Engine used: O.S. .32 SXH

Radio req'd: 5-channel heli radio w/5 servos

Radio used: Futaba 8 UHF transmitter w/5 Hitec HS 425BB servos

Gyro used: JR 460T Heading Lock Gyro

Fuel used: Wildcat 30%-nitro heli

Price: \$159

Hits

- Built subassemblies.
- Great assembly and setup instructions.
- Excellent flight performance.
- Finished main rotor blades.

Misses

- Tail-rotor pushrod movement too tight.

Features: strong composite frames; ball bearings on all pivots; major assemblies are factory-built; finished main blades; nearly indestructible canopy; colorful decals; detailed instructions.

Comments: the Century Hawk Sport is a great heli for the beginner who's just starting out and for the seasoned chopper pilot who's looking for a low-cost heli to learn new maneuvers with. Because many of the major assemblies come already built, the Hawk goes together very quickly. I had mine in the air on the same day as I opened the box. I was very impressed with the Hawk's flight performance: it's very solid in hover and has a lot of control authority for demanding maneuvers. The Hawk Sport is a great all-around heli.

CENTURY CONTROL ROD GAUGE

Making identical twins is easy



Helicopter control systems require the utmost precision, so it is very important to make sure that the control rods are of the correct length; and as we all know, helicopters have many control rods! Many helis have control rods that work in pairs, for example, the rods that connect the swashplate to the seesaw and the washout units and then to the blades. If one rod is slightly longer or shorter than the other, even by one turn of a ball link, it can be very difficult to properly set up and flight-trim your helicopter. If you have ever tried to set up control rods by eye, you know it's almost impossible to see whether both rods are exactly the same

length. So how do you ensure that the rods are precisely the same length?

Century Helicopter Products' neat Control Rod Gauge is simple to use and produces consistent results every time. It is made of CNC-machined aluminum anodized a cool blue color. It has a sliding scale with four balls mounted on it; two are fixed and the other two are attached to the sliding scale. Make a control rod of the correct length, snap it onto the gauge, and then make your next rod. Adjust it until it can be easily snapped onto the other set of balls; you now have a pair of control rods of exactly the same length. This is a must-have tool for all serious helicopter pilots!

Considering the Hawk Sport's low price, I was very eager to see how well it would perform. The strong-running O.S. 32SXH I used came out of another heli of mine that had plenty of run time on it. This ensured that there wouldn't be any surprises.

GENERAL FLIGHT CHARACTERISTICS

The engine fired up quickly, and I slowly advanced the throttle to get the main rotor spinning. I let the heli sit for a few minutes so the gears would work themselves in before the first liftoff. I first checked the blade tracking and was happy to see that it was right-on (thanks to the control-rod gauge). Because the engine was well used, it required only a minor high-speed-needle-valve adjustment to make it purr. The head speed was a tad on the high side, and I adjusted the throttle curve to bring it down for hovering. The rudder trim was right-on, and even with a standard servo, the JR 460T really held the tail where I pointed it. "Excellent!" was my first impression, as control response was solid without being overly sensitive. Before trying forward flight, I burned a few tanks of fuel while just hovering to get a feel for the controls.

AEROBATICS

So how does the Hawk Sport fly? In a word, "Awesome!" Forward flight handling is very solid; the Hawk has the feel of a larger heli, and it flies like a dream. The nose has a slight tendency to pitch up in forward flight; holding a little forward cyclic easily overcomes the pitching. I think that a heavier set of carbon or fiberglass blades would totally eliminate this tendency. Because it is slightly larger than the average .30-size heli, the Hawk Sport's forward flight performance is very aggressive, and—an added benefit—it is easier to see.

To really wring out the heli, I turned the over transmitter over to Rick Bell. He first set up an aerobatic throttle and pitch curve and then "had at it." He did some easy loops and rolls followed by



540 stall turns. According to Rick, the heli has a positive, agile control response, and the basic maneuvers are easy to do. He further pushed the flight envelope with some flips and tumbles; I was impressed! He also did some stationary rolls and other simple 3D maneuvers that the Hawk handled well. Autorotations with the stock wooden blades are good. All things considered, the Hawk Sport is a great heli for beginners and experts!

O.S. 32SXH and replaced it with the extended throttle arm included in the kit. When you set up the throttle arm, be sure to follow the diagram in the instructions for proper alignment. Mount the engine on the aluminum engine mount, and slide the fan shroud over the engine head, making sure that the flanged area is on top. Then slide the engine assembly into the lower frames.

I then joined the upper and lower frame assemblies. Be sure to check that you have the proper gear mesh and clearance between the main gear and the clutch bell. With my O.S. 32, it came out perfect, but if you use an engine other than an O.S., you will need to check this. Next I installed five Hitec HS-425BB standard ball-bearing servos. Installation is straightforward; just pay attention that you position them as shown in the manual.

All helicopters require the use of a gyro to stabilize the tail, and I used a JR 460T Heading Lock Gyro. This state-of-the-art gyro features manually selectable rate and tail lock modes, and I mounted it just behind the throttle and collective servos with some double-sided tape. I then installed the servo tray on the front of the main-frame assembly and added the fuel and vent lines and the clunk and stopper to the factory-installed fuel tank. Even though the fuel stopper is secured with a screw that compresses it, the instructions recommend that you add a tie strap around the cap. I installed the muffler on the engine and used a little high-temperature silicone to ensure a tight seal between the engine and muffler. This completes the main-frame assembly.

ROTOR HEAD AND TAIL-BOOM ASSEMBLY

I added the flybar, its control arms, flybar weights and paddles to the rotor head and then bolted the rotor head to the main shaft. I then aligned the flybar paddles, making sure they were in line with the control arms and with each other. Next, I installed the land-

ing gear, and I attached the struts to the main frame with bolts and locknuts. Be sure that the rear of the skids extend about 30mm from the rear strut.



The main rotor is of a standard configuration and works extremely well. The swashplate, washout, seesaw and rotor head are assembled at the factory.

Last, add the tail boom to the main-frame assembly. First, you'll need to take the tail-rotor gearbox apart to install it on the tail-boom and to secure the tail-rotor drive wire to the input shaft. This is necessary because the gearbox is keyed to the tail boom. I reassembled the gearbox and inserted the tail boom into the rear of the main frame. Be sure to properly align the flat end of the drive wire in the drive socket, and press the boom into the frame until it stops. The boom is keyed to ensure proper alignment to the frame and is then secured with four bolts and locknuts.

The two-piece tail-rotor pushrod uses a coupler to join the two parts. I checked the

pushrod for freedom of movement and felt a fair amount of resistance. To ease it, I removed the tail boom and enlarged the holes in the pushrod guides with a small drill bit. After I had reinstalled everything, the pushrod moved much more easily. This important check shouldn't be overlooked because if the pushrod doesn't move freely, the gyro will never be able to work at its full potential. I finished the tail boom by installing the vertical and horizontal fins and the tail-boom supports.

LINKAGE AND MECHANICAL SETUP

All of the control linkages in the Hawk Sport kit are assembled to their correct lengths—a great timesaver. The manual also states the correct rod lengths for both sport and 3D aerobatics. It's a good idea to check any pair of rods on a rod gauge (see "Century Control Rod Gauge" sidebar). I then added the pushrods to their respective servos and the bellcranks according to the manual. I turned on the radio and made sure that all of the servos were centered. Using the subtrim feature of my Futaba 8UHF transmitter, I slightly tweaked the centers on some of the servos to achieve perfect neutrals.

Next, I checked the swashplate to ensure that it was level when looked at both from the side and from the rear; I slightly adjusted the pushrods to level the swashplate. Next I leveled the bellcranks and the washout and seesaw units as indicated in the manual. I made some additional adjustments until everything was correct: I adjusted the throttle endpoints to ensure that the throttle would open fully and close without binding the servo.

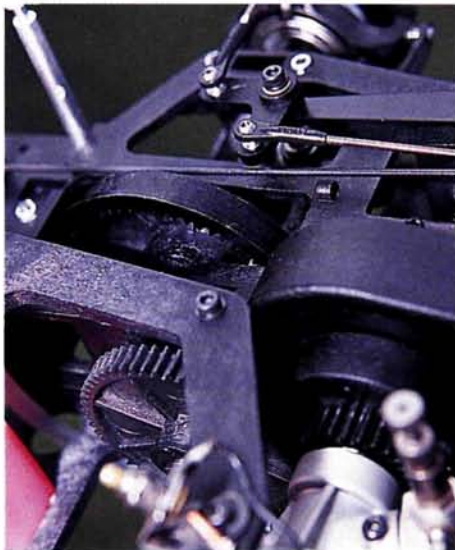
I wrapped the receiver and battery in foam rubber and installed them on the front tray. A really nice feature of the Hawk Sport is that all the servo wires exit the front of the frame. This makes it very easy to neatly secure and hide them and have a very clean, tidy-looking heli.



A wire, much like a drive shaft in a car, drives the tail rotor. This setup proved to be very reliable and trouble-free.

RADIO SETUP

The Hawk Sport manual's radio-setup section is very well written. It walks you through the pitch requirements for novices as well as the advanced settings for aerobatics. The manual details how to properly set up 3D flight conditions, including normal mode, idle-up I and idle-up II. You will need to use a heli pitch gauge to make these adjustments (at your local hobby shop for around \$20).



Here's a look at the Hawk's drive train. This two-stage transmission operates very smoothly.

FINAL DETAILS

I attached the blade reinforcements to the roots of the main blades. I traced their outlines on each side of the blades and carefully removed the covering. I glued the reinforcements to the bare wood with thick CA and fastened them with screws. I then carefully balanced the blades using a blade balancer and attached a piece of tracking tape to the lighter blade. The last steps are to trim the

canopy and install the decals. Using a sharp knife, I trimmed the plastic from the canopy's windshield area and installed the canopy mount. I cut the windshield along the marked lines and attached it to the canopy with six small screws. I completed the heli by applying the decals to the canopy and the tail feathers.

SUMMARY

The Hawk Sport is an inexpensive and easy-to-build helicopter. It's very well constructed and rugged—perfect for an entry-level machine. The manual is very well written and contains setup information for beginners and seasoned pilots. Whether you are just starting out in model helicopters or are moving on to advanced 3D maneuvers, the Hawk Sport really hits the mark with its impressive flight performance. ✈

Century Helicopter Products (408) 942-9521; centuryheli.com.
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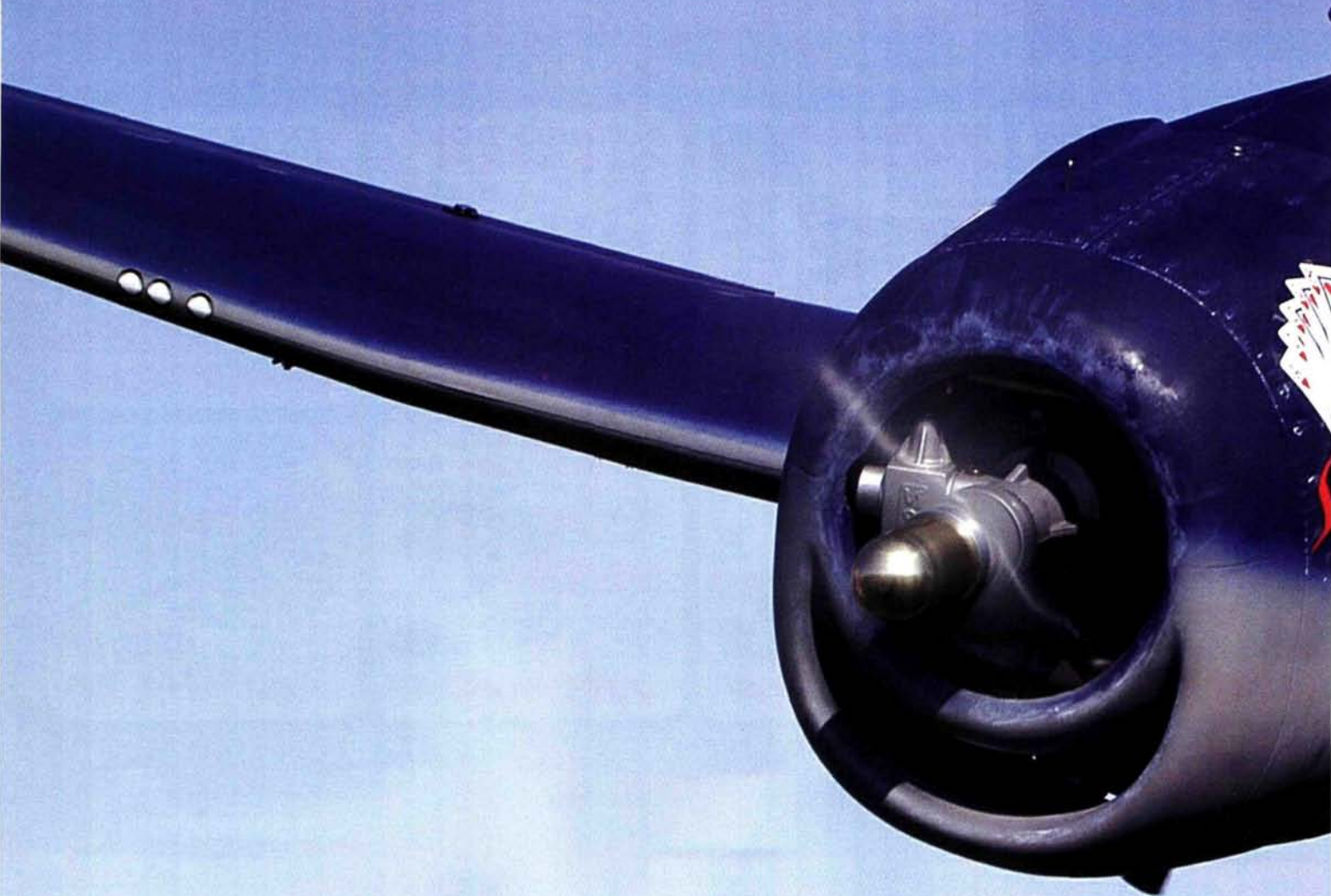


GIANTSCALEPLANES.COM



F6F

The F6F Hellcat was one of the most lethal fighters of WW II, and Giantscaleplanes.com's Hellcat model brings the excitement of this classic dogfighter to the pilot who does not want to spend countless hours at the workbench. Although not exact scale, this model is a cut above the average film-covered ARF, and it is an excellent choice for a modeler who wants to build his or her first warbird.



Beautiful detail and flight manners to match

by Peter Abbe

Hellcat



PHOTOS BY PETER ABBE & CHERI SASSMAN

KIT CONTENTS

This kit features a fiberglass fuselage, cowl and belly pan with molded panel lines, hatch detail and cutout positions. The wing, ailerons, flaps and tail feathers are built-up balsa covered with Solartex. All of these components are beautifully painted in a matte finish with a two-tone color scheme, and the clear plastic canopy is also painted. The included two large sheets of self-adhesive decals will give the Hellcat a finished appearance. All of the parts are sealed in plastic bags; the only damage I found were small dings in the vertical fin and on the tip of the right aileron.



The Hellcat comes out of the box just as you see it here. Check out that beautiful 2-tone paint scheme.

The kit includes most of the hardware needed to complete construction: a plastic-composite engine mount; a fuel tank; wire landing gear; main wheels and a tailwheel; various hardwood mounting blocks and screws; bolts; pushrod dowels and wires; control horns and clevises.

The 13-page construction manual contains only line drawings and brief notes; experienced builders should have no difficulty completing the model, but novice builders would benefit from a more thorough manual.

ENGINE AND SERVO INSTALLATION

Minimum work is required to prepare the fuselage for the engine and servos, but you'll need some type of cradle to hold the fuselage

while you install the radio components and engine. The plywood formers, servo tray and firewall are pre-installed. The provided plywood spacer block ensures that the engine is mounted the proper distance from the firewall. This block significantly increases the firewall's strength and should not be omitted. I used the two-piece plastic-composite engine mount supplied with the kit; this mount will easily accommodate any engine in the manufacturer's suggested range of a .91 2-stroke or a .91 to 1.20 4-stroke.

After you've mounted the engine, you can accurately position the cowl and attach it to



The O.S. .91FX easily fits the supplied, two-piece engine mount. A plywood block is mounted on the firewall to allow sufficient engine space and to strengthen the area.

hardwood blocks that you must glue to the firewall. To ensure that the muffler would fit inside the cowl, I substituted a Davis diesel Soundmaster for my O.S. .91FX's stock unit. Because I also used a Du-Bro exhaust deflector, I needed only to cut a small hole in the bottom of the cowl for the exhaust exit.

Servo installation is straightforward: simply drop the servos into the plywood tray, drill the mounting holes and then screw them into place. Make the pushrods using the supplied dowels and pushrod wire and secure the wires to the dowels with the included heat-shrink tubing. I used the provided quick

SPECIFICATIONS

MODEL: F6F Hellcat

MANUFACTURER: Giantscaleplanes.com

TYPE: scale warbird

WINGSPAN: 70 in.

WING AREA: 825 sq. in.

WEIGHT: 10.5 lb.

WING LOADING: 29.3 oz./sq. ft

LENGTH: 53.5 in.

RADIO REQ'D: 5- to 6-channel w/6 to 7 servos

RADIO USED: Futaba T6XA with JR Expert SL500 servos on ailerons and flaps; Futaba 3003 servos for the other controls.

ENGINE REQ'D: .91 2-stroke or .91 to 1.20 4-stroke

ENGINE USED: O.S. .91FX 2-stroke

PROP USED: APC 14x6

FUEL USED: Powermaster 10-percent nitro

PRICE: \$350

FEATURES: the Hellcat features a fiberglass fuselage (with integral vertical fin), cowl and belly pan; built-up and sheeted, Solartex-covered wings and tail feathers; all components painted in an authentic two-tone scheme; provisions for retract installation; hardware, engine mount, fuel tank, fixed landing gear and wheels are included.

COMMENTS: this ARF offers the modeler an easy-to-build warbird that can be assembled in a few weeks. The high quality and completeness of this kit makes it well worth the price. The Hellcat would be an excellent choice for a first warbird.

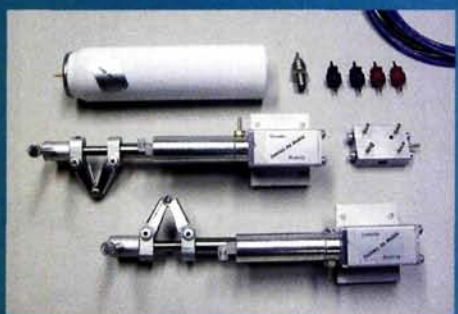
HITS

- High-quality components.
- Easy construction.
- Beautiful finished appearance.
- Fantastic flight performance.

MISSES

- Instruction manual lacking in detail.
- Belly pan didn't fit well.

RETRACT INSTALLATION



The Century Jet Models Centurion retractable gear, 11-ounce air cylinder and adjustable selector valve make a rugged, easy-to-install system. This gear is an excellent choice for the Hellcat's undercarriage.

Century Jet Models (CJM) Centurion rotating retracts are robust and easy to install. The air-actuated units feature T-6 aluminum bodies, stainless-steel cams and positive up- and down-locks. The functional Oleo struts are custom-sized at the factory to the length required for the Hellcat. Weighing only 14 ounces with the air system, this gear can support up to a 15-pound aircraft.

Installing this gear in the Hellcat does require minor wing modifications. Hardwood mounting blocks that come with the kit are epoxied into a plywood landing-gear box that is installed in the wing. Before you glue these blocks into place, remove a little of the inboard block to provide clearance for an air nipple and its air line. Then, slightly sand the blocks to accommodate the width of the landing-gear's body. The bottom interior of the box must also be enlarged with a sanding drum on a rotary tool.

You must remove the rear center portion of the box to accommodate the undercarriage's air

cylinder. After I had ground approximately $\frac{1}{16}$ inch off the mounting flanges, the gear dropped into position perfectly.

The CJM air system consists of an 11-ounce air cylinder, a filler valve, 10 feet of air lines, T-connectors and four "quick-disconnects." The heart of this system is a four-way selector valve that controls the speed at which the gear retracts and extends. Four setscrews allow independent control of each gear. The valve is bolted to an $\frac{1}{8}$ -inch plywood plate next to a retract servo. This unit is then installed inside the fuselage with silicone adhesive.

Although this valve can be used with a conventional radio, a computer radio makes it much easier to precisely set the control-movement necessary to properly actuate the valve. The Hellcat's cavernous fuselage easily accommodates the valve and the air cylinder. You can cycle fully charged gear four times before the system needs more air. A larger air cylinder would increase the number of cycles per charge.



F6F Hellcat:

KING OF THE PACIFIC

OK; we'll admit it: just about every successful WW II fighter was sleeker and sexier than the Hellcat. When it comes to fighters, however, beauty is "in the doing," and the Hellcat could do it in spades! In terms of what it contributed to victory, it was the uncontested king of the Pacific.

The Hellcat was unique among almost all WW II fighters because, from the beginning, it was designed to be flown and maintained by teenagers who were barely out of high school. Grumman wanted all of its airplanes to provide outstanding performance while allowing a huge margin for error in the hands of 200-hour pilots and recently trained mechanics. This meant that simplicity in both its aerodynamics and mechanical design had to be foremost in the designers' minds right from the get-go.

Another goal was that the plane had to go together easily and quickly, and that is why the Hellcat looks as if it has been assembled by a locomotive manufacturer: rivet heads stick out everywhere. There was an elegance in the way LeRoy Grumman directed his engineers: apply sophistication only where it's needed. For instance, only the leading edges of the wings were flush riveted, where this would have the most effect.

When you compare the Hellcat fuselage with those on a Mustang and Corsair, you can see their ineffectual complexity. The Hellcat's curves are accomplished with a multitude of narrow, flat sheets—much like an armadillo's armor—that can be produced in minutes and not the hours of tooling and production required to stretch-form compound-curved sheets.

With its 2,000hp R-2800 Pratt and Whitney engine and huge wing area, the Hellcat was one of the fastest climbing airplanes of the War (3,500 feet per minute), and the wings that helped it climb also helped it turn. It could fight the Zero on its own terms. More important, it could

absorb enormous punishment and still bring home its young (and probably scared) pilot.

Incidentally, let's dispel an aviation legend right here: the F6F Hellcat was not designed after a Zero was captured intact during attacks on Aleutian Islands early in the War. By that time, the Hellcat's prototype was already flying, and the primary value of the captured Zero was in telling the Navy and Grumman Aircraft that their basic design assumptions had been dead on the money.

With a downward-sloping cowl and high pilot position, the visibility over the Hellcat's nose was superb in the air and on approach to a carrier. Those features, combined with its excellent slow-speed handling and docile stall characteristics, made it one of the easiest airplanes ever designed to land on a carrier. Many airplanes and pilots lived to fight another day because LeRoy Grumman had a firm rule that the airplane should have no vices whatsoever in the carrier environment and that anyone should be able to fly it.

When the numbers were tallied, an incredible 12,000-plus Hellcats had been built, and they downed more Japanese aircraft than any U.S. fighter in the War with a 19:1 kill ratio. There wasn't even a close second. Equally important, it carried huge bomb, rocket and napalm loads down to the deck and proved itself to be the very embodiment of the term "fighter-bomber." It did it all, it did it well, and it did it while providing as much safety as a combat fighter pilot could reasonably expect from his mount.

King of the Pacific; yeah, that's the Hellcat. —Budd Davisson

Editor's note: in addition to having logged more than 6,000 hours in nearly 300 types of planes, including many WW II fighters, Budd Davisson is the editor-in-chief of our sister publication, Flight Journal.

connectors to attach the pushrods to the servo arms and added thread-lock to secure the retaining nuts to the connectors. Using Z-bends in the pushrod wires instead of these connectors would provide a simpler, more secure linkage.

The cutouts for the pushrod exits are molded into the fuselage. Carefully open these areas using a cutoff wheel in a Moto-Tool (if you use a hobby knife, you could chip the paint). The throttle arm's location on my O.S. .91FX made it necessary for me to reverse the positions of the throttle and rudder servos; I also had to cut the rudder's pushrod exit on the opposite side of the fuselage.

I glued pieces of 1/8-inch plywood inside the fuselage to reinforce the canopy mounting locations and attached the canopy with four screws. For added realism, I installed a Giantscaleplanes.com no. 5 pilot figure in the cockpit. To make him the proper height, I ground approximately 1/2 inch off the base of the figure.

TAIL FEATHERS

Before you attach the tailwheel, drill a hole through the bottom of the fuselage just aft of the vertical fin to accommodate the brass bushing that supports the tail-gear's wire. After you've passed the wire through the bushing, create a 90-degree bend at the top of the wire, and drill a hole in the rudder's leading edge to accept the wire.

The stabilizer is supported by an aluminum-tube spar that runs through the fuselage. Outer fiberglass tubes have been factory installed in the stabilizer. Use a rotary tool to cut out the molded "holes" in the fuselage sides to accept the spar. For a more secure glue joint, sand the paint off the fuselage where it mates with the root of the stabilizer before you apply the epoxy. Masking tape applied to the fuselage around this joint will help prevent excess adhesive from oozing onto the surface.

At this point, the rudder and elevators can be attached. It is much easier to install the control horns before you permanently attach these surfaces. I replaced the included control horns with Du-Bro adjustable control horns, which I find much easier to install and adjust. The hinges included with the kit are for position only and must be replaced as well; I used Du-Bro pinned hinges.

WING HALVES

The wing halves are fully sheeted with balsa; handle them carefully to avoid damaging them. The holes for the servos, landing-gear mounts and wheel wells have been cut out at the factory; just remove the covering from these areas with a sharp hobby knife. Save these scraps of covering for future repairs.

Each aileron's servo is screwed into the plywood plates that are beneath the wing's surface. Trim the supplied plastic

I set the control throws to the maximum prescribed by the manual (aileron and elevator +/- 20mm, rudder +/- 30mm, flaps -35mm). The Hellcat was easy to control on the ground, but it tended to nose over in rough grass. Moving the plane to a paved runway quickly solved this problem.

TAKEOFF AND LANDING

Advance the throttle slowly, and the Hellcat tracks very smoothly. A small amount of right rudder is needed to maintain its heading. I made all takeoffs with the flaps up and the engine at 1/2 to 3/4 power. This is a solid flying aircraft!

Landings are as effortless as takeoffs. Just line the plane up, lower the gear and flaps, and reduce power. The Hellcat settles nicely, slowing down to a very comfortable landing speed. With careful throttle management, you can have very precise and controlled touchdowns. To prevent an untimely tip stall, be sure to keep some power on. The Century Jet undercarriage easily handled all landing loads.

LOW-SPEED PERFORMANCE

Simply put, the Hellcat handles like a pussycat. Its slow-speed performance is very much like that of a lightly loaded sport plane. With flaps and gear down, it cruises comfortably around the sky with the engine at less than 1/2 throttle. I am very impressed with this model's low-speed performance and haven't noticed any bad habits.

HIGH-SPEED PERFORMANCE

With the gear up and flaps up, this airplane can cover a lot of ground quickly. At full throttle, it is very smooth and responsive without any sign of control-surface flutter. Low, high-speed passes are exciting and true to scale.



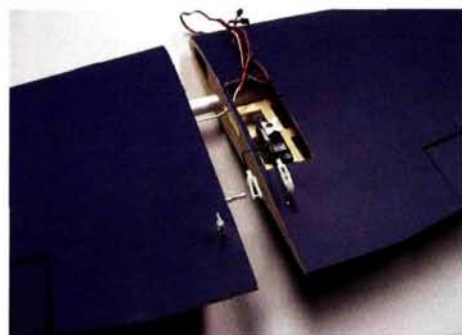
AEROBATICS

The Hellcat is a very capable airplane. With the O.S. .91FX up front, it has ample power for any scale maneuver: loops, barrel rolls, Cuban-8s and stall turns are effortless. Four-point rolls are fantastic, and inverted flight is very solid; it requires only a small amount of down-elevator.

At its specified settings, the aileron response was nearly perfect; the rudder authority was, however, somewhat lacking. The elevator became more sensitive when the landing gear was retracted. This is obviously because the center of gravity shifted aft.

covers to size before you use them to cover the servos. The paint is easily chipped off the cover's edges when you trim them; Giantscaleplanes.com will soon offer paint to touch up these areas.

The flaps are actuated by a servo mounted in the center of the wing. Two pushrod wires are soldered together and then connected to torque rods that run through the trailing edge and are keyed into the flaps. This method is effective, but I found it impossible to remove all of the play from the torque rods.



The wing halves are joined using a spar tube, and an aluminum pin is used to align the two. Flaps are driven by a single servo that is connected by a split linkage to the two torque rods.

LANDING GEAR

Installing the fixed landing gear is very simple. Epoxy the supplied, grooved hardwood blocks into the wing and slide the gear into place; retain it with smaller blocks. Instructions and bellcranks for mechanical retracts are included with the kit, and gear doors and plastic wheel wells are supplied to dress up the installation. I decided to install Century Jet Models retracts, but their size and shape prevented me from using the accessory parts (see "Retract installation").

Install the servos and undercarriage before you join the wing panels. Then join the wing halves, which are aligned with an aluminum

spar tube and a small aluminum pin. Use slow-curing epoxy to ensure this joint's integrity.

FINAL ASSEMBLY

Attaching the wing to the fuselage is straightforward. Epoxy two aluminum pins into the wing's leading edge; drill two holes in a former in the fuselage to accept these pins. After checking the alignment, drill the holes through the wing's trailing edge and into the hold-down blocks in the fuselage. I replaced the included steel hold-down bolts and blind nuts with 10-26 nylon bolts because nylon



Aileron servos are concealed by plastic covers. Each aileron is driven by a separate servo.

bolts are less likely to be vibrated loose.

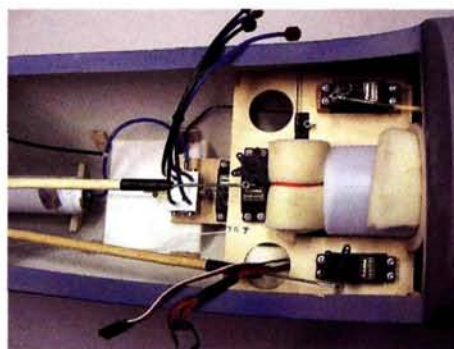
With the wing bolted to the fuselage, glue the fiberglass belly pan into place. This was the only component that didn't fit perfectly in position. I contacted Giantscaleplanes.com and was promptly sent a new belly pan, but the replacement fit the same. With a little bending and some minor modification, I was able to achieve an acceptable installation.

If you install retractable gear on the Hellcat, balance the plane with the gear retracted. Using a Harry Higley Big Hub and mounting a 1400mAh JR battery pack in front of the firewall, I balanced the model at the farthest aft suggested location. When the gear is extended, the balance point shifts much closer to forward center of gravity (CG) range.

CONCLUSION

The Giantscaleplanes.com Hellcat is an

excellent subject, and it is without question the finest ARF that I have ever assembled. Its simple construction, scale details and overall appearance are certain to appeal to those modelers who don't want to invest countless hours in building. This is a rewarding project that's guaranteed to attract much attention from your fellow club members. Now, if I can talk my club into building an aircraft carrier at the field ✈



The fuselage interior is spacious; it has ample room for the radio gear, air cylinder and retract valve.

APC Props; distributed by Landing Products (530) 661-0399; apcprop.com.

Century Jet Models (502) 266-9234; centuryjet.com.

Davis Model Products (203) 877-1670.

Du-Bro Products (800) 848-9411; dubro.com.

Futaba Corp. of America; distributed by Great Planes Model Distributors Co.; futaba-rc.com.

Great Planes Model Distributors Co. (800) 637-7660; greatplanes.com.

Giantscaleplanes.com (610) 282-4811; giantscaleplanes.com.

Harry Higley & Sons Inc., P.O. Box 532, Glenwood, IL 60425; <http://members.aol.com/harryhig/MainMenu.htm>.

JR; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

O.S.; distributed by Great Planes Model Distributors Co.; osengines.com.

PowerMaster Hobby Products Inc. (512) 285-9595; powermasterfuels.com.



A 3D performer not even Houdini could top!



Fun-fly aircraft have become tremendously popular over the past few years. Before that, only a handful of kits could truly be called "fun-fly models." My tastes have always leaned more toward scale aerobatic planes such as the Extra 300 and CAP 232, but after watching world-class TOC pilots like Jason Shulman and Chip Hyde, I found myself hungry for 3D aerobatics. I soon realized that it's very difficult to get a 40- to 60-size scale aerobat to perform 3D maneuvers such as the torque roll; the general consensus seemed to be that bigger is better when it came to such feats. Then I discovered the Model Tech Magic.

by Erick Royer

Model Tech

Magic



PHOTOS BY RICK BELL

OUT OF THE BOX

The Magic comes well packaged; I was pleased that all the components were individually bagged and separated by cardboard dividers. Everything arrived in perfect shape, with no wrinkles or bubbles in the covering.

As do most ARFs, the Magic comes with a complete set of hardware. A unique feature of this plane is the use of pull/pull controls on both the elevator and the rudder. Because there were few components in the box, I was sure that I could complete this in short order.

ASSEMBLY

Wing. Assembly begins with the wing, and the manual contains an addendum that thoroughly covers this step. I inserted the plywood wing joiner into one wing half and then trial-fit everything together. The fit was good; no adjustments were required. Using my Great Planes Woodpecker, I made small



The Hitec 425BB servos I chose for the rudder and elevator fit nicely in the preformed servo tray, and they performed well. If, however, you decide that you prefer a little more power, Hitec 605BB servos would work just as well.



The horizontal stabilizer and vertical fin were easy to assemble; I held everything in place with 5-minute epoxy. For maximum control throw, I used a set of long Du-Bro control horns on the rudder and elevator.

holes in both sides of the wing joiner and in the root ribs on each wing half, glued the halves together with 30-minute epoxy and held them in place with masking tape.

I installed the ailerons next. Each aileron has CA-type hinges already installed. I used a hobby knife to open the slots in the trailing edge of the wing and then trial-fit the ailerons. The instructions call for a 1.5mm space between the aileron and the wing. Using a T-pin as a spacer, I secured the ailerons to the wing with several drops of thin CA. I sealed the hinge gaps with 1/2-inch clear tape as illustrated in the instructions.

Because the decals on the bottom of the wing would eventually cover the servo openings, I decided to jump ahead and apply the wing decals at this point. This allowed me to simultaneously cut the graphics and the

covering from the openings. To make it easier to position the decals, I sprayed a mixture of dish soap and water on the wing and then used paper towels to remove the excess liquid and place the decals.

Next, I located the holes for the aileron servos and removed the covering. Two Hitec HS-425BB servos are perfect for the ailerons. Each wing half contains a string to help pull the servo wires through. Using the self-tapping screws that came with the servos, I secured them to the wing. Be sure to center the servo-output arms before you mark the control-horn positions on the ailerons. I attached the control horns and made two pushrods with a plastic clevis on one end and an L-bend with a keeper on the other. I used a piece of fuel tubing on each clevis and keeper to make sure that they wouldn't come off in flight. Note: the included clevises come in two sizes; the ones for the ailerons have a larger threaded hole than those for the rudder and elevator.

The last step in the wing assembly is the installation of the wing-band reinforcement block. Simply cut away the covering and attach the block with 5-minute epoxy.

Fuselage. The first step in assembling the fuselage is to install the landing gear. The gear is made of bent up wire with welded supports, and it's attached with four nylon straps and self-tapping screws. Attach the wheels by sliding the plastic spacer onto the axle, followed by the wheel secured with a wheel collar. Two nylon straps and self-tapping screws hold the tailskid in place. Make sure that the skid is aligned parallel with the fuselage before you tighten the screws.

The next step is to permanently install the servo tray. I removed the tray from the fuselage and affixed the two rails to the bottom with medium CA. Before the tray can be installed, you must cut the pushrod tubes so they are flush with the former. Use a sharp hobby knife for this. As shown in the picture in the instructions, make marks on both sides of the fuselage for the servo tray. I positioned the tray on the marks, slid it as far forward as I could and used 5-minute epoxy to hold it in place.

Next, I installed the engine mount. The instructions show the engine at a 45-degree angle, but I decided to mount mine inverted. To obtain the correct measurements for the mounting holes, I used thin CA to temporarily tack the rails to the engine. Beginning with the horizontal and vertical centerlines, I transferred the measurement from the mounting holes to the firewall. Next, I drilled the holes and applied blind nuts to the back of the firewall. I used the supplied bolts to mount a Magnum .46XLS engine on the rails.

The page in the instruction manual that covered assembling the fuel tank had been accidentally printed upside down and in a language other than English. Fortunately, however, the pictures included dimensions, so I was able to proceed. I assembled the fuel

SPECIFICATIONS

MODEL: Magic

TYPE: 3D fun-fly ARF

MANUFACTURER: Model Tech

DISTRIBUTOR: Global Hobby

WINGSPAN: 52 in.

WING AREA: 725 sq. in.

WEIGHT: 4 lb., 4 oz.

WING LOADING: 13.4 oz./sq. ft.

ENGINE REQ'D: .36 to .46 2-stroke or .52 4-stroke

ENGINE USED: Magnum .46XLS 2-stroke

RADIO REQ'D: 4-channel w/5 servos (rudder, elevator, throttle and 2 ailerons); 5-channel w/optional spoilers

RADIO USED: Futaba 9C w/5 Hitec servos

PROP USED: APC 12.25x3.75

FUEL USED: Wildcat 15%

PRICE: \$99

FEATURES: balsa-and-ply construction; covered in Ultracote; pull/pull controls for the elevator and rudder; large control surfaces; includes a complete set of hardware and decals.

COMMENTS: the Model Tech Magic is a very impressive model. It is well constructed, nicely covered and can be ready in just a few short afternoons.

HITS

- Excellent flight performance.
- Nice covering scheme and decals.
- Quick and easy to build.
- Light wing loading.

MISSES

- None.

tank using a vent line and a supply line, and then I installed the tank in the fuselage. I also installed a small balsa brace behind the tank to prevent it from sliding back.

I marked the location for the throttle pushrod, drilled the hole and installed the pushrod tube. I used a Hitec HS-81 mini-servo right behind the fuel tank for the throttle. I used a Z-bend to connect the pushrod to the throttle arm on the carburetor and then attached the other end to the servo arm with an E-Z connector.

Tail feathers. Now it was time to install the tail surfaces. I positioned the horizontal stabilizer and vertical fin on the fuselage and marked the position of the fuselage sides on the tail surfaces. I then removed the covering inside these lines, and, using my Great Planes

The first flights took place on a sunny day with a steady 10mph wind blowing right down the runway. At the field, I attached the wing with 10 elastic bands. After a final check of the controls, I was ready to start the engine and perform a range check. The engine was bench-run before I installed it in the plane. Taking the time to properly break in the engine will save you a lot of hassle at the field. The Magnum .46XLS performed flawlessly.

TAKEOFF AND LANDING

The Magic has a rather high angle of attack as you taxi it around. Because of this, you need to be cautious and apply power gently, or the plane will take off before you expect it to. The ground handling is tricky because of the fixed tailskid. The model is steered on the ground by means of the air passing over the rudder. This can make ground handling sluggish, especially on grass fields. I pointed the Magic into the wind and prepared to take off. Before I had reached $\frac{1}{3}$ throttle, it was airborne. No trim changes were required for a straight and level climb-out.

Landings were very easy. The Magic is a real "floater," and it will remain airborne even at the slowest speeds without danger of stalling. Several landings were performed into the wind with little, if any, rollout.

LOW-SPEED FLIGHT

The Magic can be slowed to a crawl before it shows signs of stalling. When you do let the speed get too slow, the controls get a bit mushy, but the plane wants to keep flying. Because of its large airfoil, the Magic can perform excellent slow-speed aerobatics. One of my favorite maneuvers is to fly the Magic into the wind and vary the throttle until the plane is just standing still in midair. It's very cool!

HIGH-SPEED FLIGHT

The Magic was not really designed for high-speed flight. As a result of my choice of a larger diameter, low-pitch propeller, the Magic is better suited to slow-speed and 3D flight. Even at full throttle, high-speed flight is marginal at best.

AEROBATICS

This is what the Magic was designed for! It tracks well in both inside and outside looping maneuvers,



and rolls are very fast and axial—and this is all on low rates. A quick flip of the switch, and the Magic really came alive. Tumbles, spins and blenders happen so fast that you almost cannot tell what's happening. With high rates, loops are so tight that you could swear the propeller is going to cut off the tail. I tried several knife-edge passes but experienced some roll and pitch coupling. I used the transmitter to dial out some of this for later flights. Hovering maneuvers are awesome with the Magic. I am no 3D expert, but I did find that it was rather easy to get the Magic to sustain a hover at $\frac{3}{4}$ throttle. The plane had plenty of reserve power to pull straight up from a hover. The Magnum .46XLS engine is a perfect choice for this aircraft.



Two Hitec HS-425BB servos are the perfect choice for the Magic's ailerons, and they're a snap to install. Each wing half contains a string to help pull the servo wire through, and the wings are easily attached by means of the supplied self-tapping screws.



Model Tech suggests that you mount the engine at a 45-degree angle, but I chose to mount mine inverted instead. The Magnum .46XLS provides plenty of power to allow the Magic to perform all the 3D maneuvers it was designed for.

Woodpecker, I prepared the exposed balsa for epoxy. Using 5-minute epoxy, I attached the tailpieces to the fuselage. Make sure that the stabilizer remains parallel to the wing's trailing edge and that the vertical fin rests at a perfect 90-degree angle to the stabilizer. Be sure not to get epoxy in the pushrod exit when you glue the stabilizer into place.

Radio gear. I used Hitec HS-425BB servos for the rudder and elevator. These are standard servos that work well, given the control-surface sizes. If you decide that you need more power, you can switch to a Hitec HS-605BB servo. The elevator servo is flush-mounted on the servo tray, and the rudder servo is mounted on support blocks that are epoxied to the servo tray. I used a set of long control horns from Du-Bro and had to cut the ends so they wouldn't contact the fuselage sides. These horns will provide maximum control-surface throw.

Next, I attached the control horns to the rudder and elevator with the included bolts and nuts. I found it easier to slide the pushrods into their respective tubes and attach the clevis to the control horn first. With all the control surfaces and servos centered, I made a Z-bend where the rods should be attached to the servo arms. (The manual suggests that you make an L-bend and use a keeper, but either method will work fine.)

FINISHING UP!

At this point, the model is pretty much ready to go. The last two components to install are the battery and receiver. I placed the receiver next to the throttle servo and routed the antenna wire along the bottom of the fuselage. Before I installed the battery, I thought it would be a good time to balance the model.

The manual states that the CG should be 115mm behind the leading edge of the wing. I set my Great Planes CG Machine to 115mm and placed the plane on it. To my dismay, the model was very nose-heavy. I began to position the battery in various places on the fuselage to see where it would balance. I ended up cutting a hatch for it on the bot-

tom side of the fuselage, about 3 inches behind the servo tray. I used a 6V, 1100mAh battery. The plane then balanced perfectly.

The last step is to set up the control throws and the radio. I use two rates on my Futaba 9C radio. I have low rate set to the measurements indicated in the manual, but I decided to set the high rates to maximum deflections. I'm counting on the extra control throw for 3D maneuvers. I did use 50-percent-negative exponential on all channels at high rates; this keeps the controls soft near the center, even on high rates.

CONCLUSION

The Model Tech Magic is a very impressive model. It's quite well constructed and nicely covered. The assembly is so quick and easy that the model can be ready to fly in just a couple of afternoons. The Magic is a great choice for modelers who want to learn 3D aerobatics without spending thousands of dollars on a large, TOC-type aircraft. In a very short time, you'll find yourself the center of attention at your next fun-fly! ✦

APC Props; distributed by Landing Products (530) 661-0399; apcprop.com.

Du-Bro Products (800) 848-9411; dubro.com.

Futaba Corp. of America; distributed by Great Planes Model Distributors Co.; futaba-rc.com.

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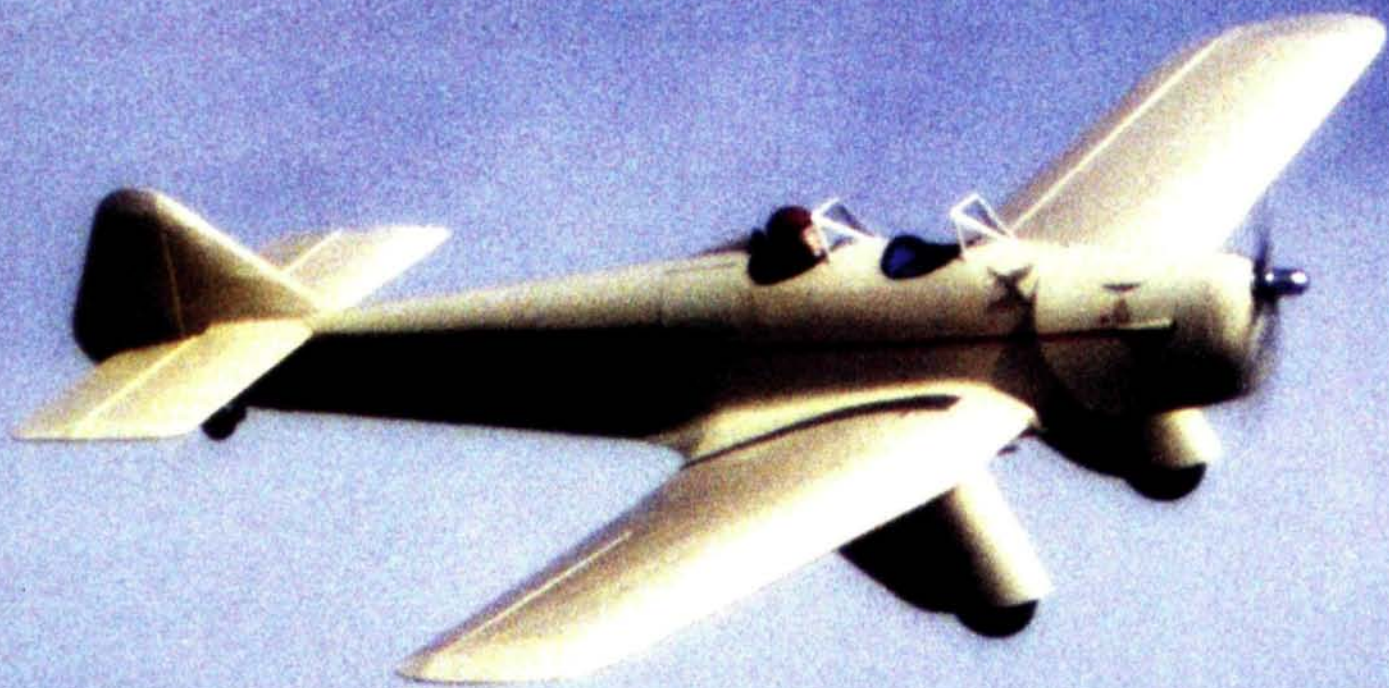
Great Planes Model Distributors Co. (800) 637-7660; greatplanes.com.

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Magnum; distributed by Global Hobby Distributors.

Model Tech; distributed exclusively by Global Hobby Distributors.

Wildcat Fuels (859) 885-5619; orders only (888) 815-7575; wildcatfuel.com.



*A classic early racer with
aerobatic performance*

MILES HAWK



PHOTOS BY ROBERT TAYLOR

MAJOR

by Robert Taylor

Until June 1999, when I got my issue of *Model Airplane News*, the "Name That Plane" contest. Just one look, and I

airframe. The wings were sheeted with a then new space-age material called plywood—wow! The wings were cantilever, and so was the tail (no braces or rigging wires). Its wings were tapered; the plane looked very clean and fast. I believe simplicity is the height of engineering genius. I contacted Bob's Aircraft Documentation for a photo package for the Miles Hawk Major. It included a nice stack of pictures and a small drawing that I scaled up to fit my O.S. .70 4-stroke. I detailed the plane quite a bit, and with its MonoKote finish, it still came out at only 6 pounds. This gave me an 18.25 oz./sq. ft. of wing loading. If there's one figure that predicts how well an airplane will fly, it is the wing loading!

The Hawk flies like a dream: it's gentle, it requires no trim adjustments, it flies fast and is quite acrobatic. My friend Choni Irvin test-flew the model and said it flew beautifully. He wrung it out for me; more about that later.

I had never heard of a Miles Hawk Major; then, there it was in was hooked. Built in 1934, the original Miles Hawk had an all-wood

CONSTRUCTION

First, refer to the plans and cut all the wing ribs from the proper material type and thickness. Be sure to accurately mark the neutral axis line on each rib. I use a wing-building jig, so I drilled two holes in each rib to accept the 1/4-inch steel rods that hold the ribs in proper alignment (see photo). Use the spar notches as a guide, and drill all the front holes first. They should all be centered on the rib reference line and the same distance from the spar notches. Now drill the rear holes on all the ribs at the same distance from the front holes. I used plywood and fastened two 3/8-inch pieces on it so the ribs fit into them at the spar location; I then clamped them to my drill press to drill the holes. Since the main spar is straight from root to tip, use the same hole spacing on the tapered ribs and keep the holes in the same locations on the reference line relative to the spar notch.

WING CENTER SECTION

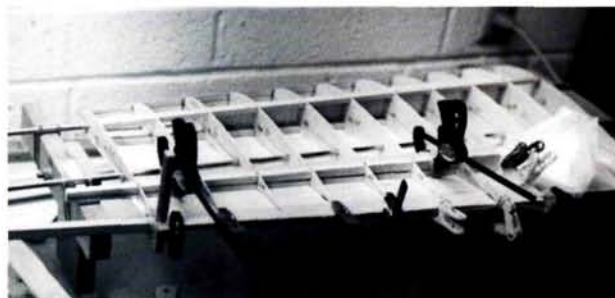
Be sure to build the structure straight, square and without twist or washout. Place the bottom 3/8-inch spruce spar over the plans, and glue the ribs onto it at the proper locations; slant the two outboard ribs inward 3 degrees. Glue the top spruce spar into place. Remove the section from the building board, and clamp it to something really straight (I use a 3/4-inch steel tube), and glue the shear webs into place. From 1/8-inch-thick balsa, make the sub-leading edge about 7/8-inch wide, and draw a straight line down its length 3/8 inch from one edge. Draw cross-lines on it to line up with the ribs, and set it on the straightedge. Clamp the structure to it so the reference lines on the ribs line up with the line drawn on the sub-leading edge.

When the glue has dried, remove the structure from the straightedge, glue in your wheel blocks, insert the steel rods through the rib holes, and put everything upside-down into your jig fixture. Before I set it in the jig, I planed the leading edge flush with the

ribs to fit the wing sheeting. Be sure that the structure is square and twist-free before you apply the sheeting. Sheet the wing section, starting from the front. Turn it over, and install the lite-ply braces that support the wing dowels, and install the wing-bolt blocks. Sand everything smooth, and set the center section aside.



The wing center section is attached to the metal tube for straightness. Ribs are glued to the leading edge.



The aileron is built in place on the wing panel. The panel is assembled in a jig, and a straightedge is clamped to the trailing edge to ensure straightness.

OUTER WING PANELS

Glue the ribs to the main spar, making sure that the root-end rib cants inward 3 degrees. Clamp the spar and ribs to your straightedge, and glue in the vertical-grain shear webbing. Make sure that the spar remains straight; once the shear webs go on, it's too late to adjust it! Cut the leading edge to shape, and glue it to the front of the ribs as you did with the center section. When you have assembled both outer panels, put all three sections together and check the alignment and dihedral. Check to see that everything is true and square. If it is, sheet the outboard wing panels on the bottom only. To achieve the proper washout in the wingtips, place each wing panel upside down in the jig, and put an 1/8-inch-thick shim under the front jig rod at the tip rib only.

Install everything inside the wing, put the wing panels together, and make and install the dihedral brace. I glued these in the outboard section only so I could clamp them securely in place while the epoxy set. Build the 1/8-inch balsa pockets in the center section so the dihedral braces can be slid into place and clamped to the spars. Don't glue the panels together yet.

Place each wing panel back in the jig (right side up), and build the ailerons. Glue a 1/16-inch aileron skin to the 1/4-inch aileron leading edge and clamp it in the wing. To make sure that the wing and aileron trailing edges remain straight, I clamped a straightedge along the wing's entire trailing edge and glued the ribs and trailing edges into place. Glue the aileron horn and horn blocks into place as well as the blocks that hold the aileron counterbalance weights. Fit the weights in place, and cut the opening in the wing bottom sheeting for them. Cut the servo openings in the bottom sheeting, and install the aileron servos. Install tip blocks for wingtip skids. You can elongate the rear jig holes in each rib to pass the servo leads through. Don't make the holes too large, as you will need them to hold the wing in alignment while you install the

top planking. Check and be sure that everything is in the outer panels, and then set them up on the jig again with the washout shim in place, and glue the top sheeting into place.

WHEEL PANTS

These are easy to make. Glue the center struts together with ribs LG5 and LG6 glued in place. Then drill the hole for the plastic attachment bolt. Drill the axle holes, and fit the struts onto the wing bottom; then drill and tap the attachment block for the bolts. Sand the struts so they fit against the wing at the proper front-view angle. Place them over the plans to get the angle right, and glue the ribs, leading and trailing edges into place. Attach the wheel pants to the wing, and line them up properly with an 1/8-inch wire run through both struts to ensure both

SPECIFICATIONS

MODEL: Miles Hawk Major

TYPE: scale

WINGSPAN: 68 $\frac{7}{8}$ in.

WING AREA: 758 sq. in.

WEIGHT: 6 lb.

WING LOADING: 18.25 oz./sq. ft.

LENGTH: 49 in.

ENGINE USED: O.S. .70 4-stroke

RADIO REQ'D: 4-channel w/5 servos (2 ailerons, rudder, throttle and elevator).

COMMENTS: designed by Robert Taylor, the Miles Hawk Major is a simple scale design that's relatively easy to build. It uses traditional balsa and ply construction and has a one-piece wing. The wing is built in three sections (center and two outer panels), and they are glued together to form the finished wing. The model has excellent flight characteristics and is fairly aerobatic.

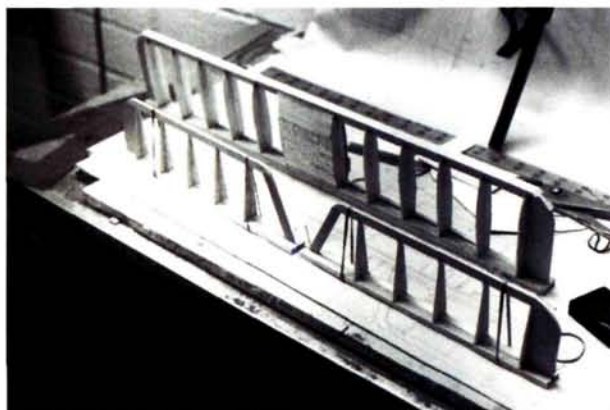
axles remain in alignment. Drill the holes for the rear alignment dowel, install the dowels, and sheet the wheel pants.

Set the center sections back on the jig and be sure there's no twist, and plank the top. Put the main leading edges on all three sections, and sand them to shape. It is easier to work with the wing in three sections rather than in one long one. Glue the wingtips in place over the rib reference line. Glue the three sections together with the reference lines aligned with one another, and set the dihedral angle. When the epoxy has cured, you should have a nice straight wing with 1.5 degrees of washout at each tip.

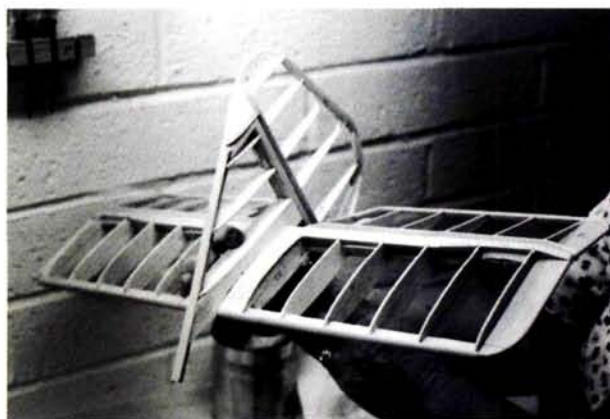
TAIL SURFACES

Cut out the elevator and horizontal stabilizer ribs, and assemble the main spar with the $\frac{1}{8}$ -inch spruce strips glued in place as shown on the plans; be sure everything is straight. Mark the rib locations on the spar, and place the spar on the workbench so the spruce strips face up. Glue the ribs in place facing up. Make the T-shape leading edge, and glue it into place on top of the ribs; then install the $\frac{1}{8}$ -inch sheet tips. Trim the center ribs, and glue the $\frac{1}{16}$ -inch-balsa sheeting in place. Be sure to install the $\frac{1}{8}$ -inch center cross-pieces before you sheet the two center ribs.

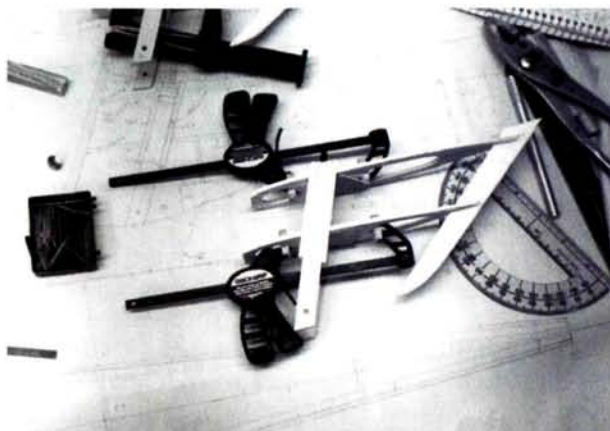
Notch the elevator's trailing edge to accept the ends of the ribs, and cut the $\frac{1}{4}$ -inch leading edge to size. Set the ribs on top of the leading edge, set the trailing edges on top of the ribs, and use rubber bands to pull everything tightly together.



The tail surfaces are built on a flat building board with the ribs pointing straight up.



The completed tail surfaces.



The basic wheel-pants assembly ready to sheet.



A very simple design. Here the two wheel pants are ready to be sanded smooth.

When everything is straight, use Zap CA to glue the parts together. Remove the parts from the workbench, and sand them smooth.

Make the brass elevator horn and the $\frac{1}{8}$ -inch-diameter elevator joiner/torque rod, and solder them together. Bevel the leading edge to get plenty of movement, and install the hinge blocks and hinges. Assemble the rudder in the same way as you did the elevator, then cut the slot in the leading edge for the tailwheel tiller arm. The tiller goes back from the tailwheel and is inserted into the rudder. The geometry makes the tailwheel move half of the rudder travel and desensitizes the steering. Sand the tail surfaces smooth and set aside.

FUSELAGE

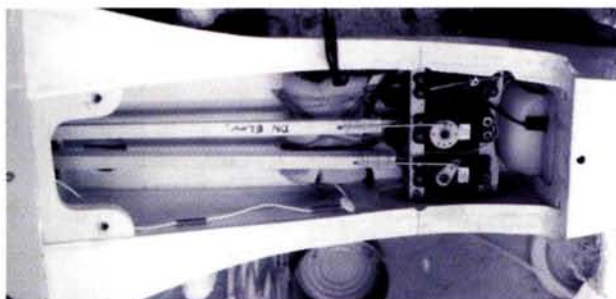
Cut the fuselage formers to shape, and glue the $\frac{1}{8}$ -inch sides and doublers together. Draw a long reference line on your workbench, and nail the cockpit floor over it with the floor sticking out $\frac{1}{8}$ inch past the end of the bench. Glue the firewall parts together, and drill the holes for the engine-mount bolts and for the fuel lines. Glue the firewall in place with the top hanging over the bench; make sure you use wax paper to prevent the firewall from sticking to the bench. Glue formers F1A and F2A to the floor piece, and when the glue has dried, wrap the fuselage-side sheeting around them. When the glue has dried, glue the wing hold-down piece in place, and glue the doubler to F1A where the front wing dowels go through it. Now glue in the triangle stock reinforcements and former F3A. On the side of the fuselage, draw a neutral axis reference line for wing alignment. Now sand the saddle so the wing will slip

into place with the poster-board fairing base sandwiched between the wing and the saddle. Check the wing incidence, and be sure that everything lines up and is square. Install the tank floor, and drill the holes for the throttle linkage. I installed the radio switch and my remote glow-plug igniter in the front cockpit floor.

Sheet the fuselage bottom with 1/8-inch balsa with the grain going crosswise. Trial-fit the tail surfaces in place, and be sure they line up with the thrust line. Install the top formers and stringers, and glue on the top planking. I installed the rear planking first using hot water and ammonia to help bend it into place. I secured it with rubber bands, and let it dry. After it had dried, I cut it to shape and glued it in place. Cut out the cockpit openings, and the fuselage is almost finished. Details for making the



The engine-cowl nose bowl is carved from a block of balsa. The bottom is also balsa, but the sides are formed from a wrap of aluminum sheet.



The internal fuselage view. Plenty of room!

wing fairing are on the plans. I covered the model with cream MonoKote and

Painted the cowl and fairings with matching LustreKote.

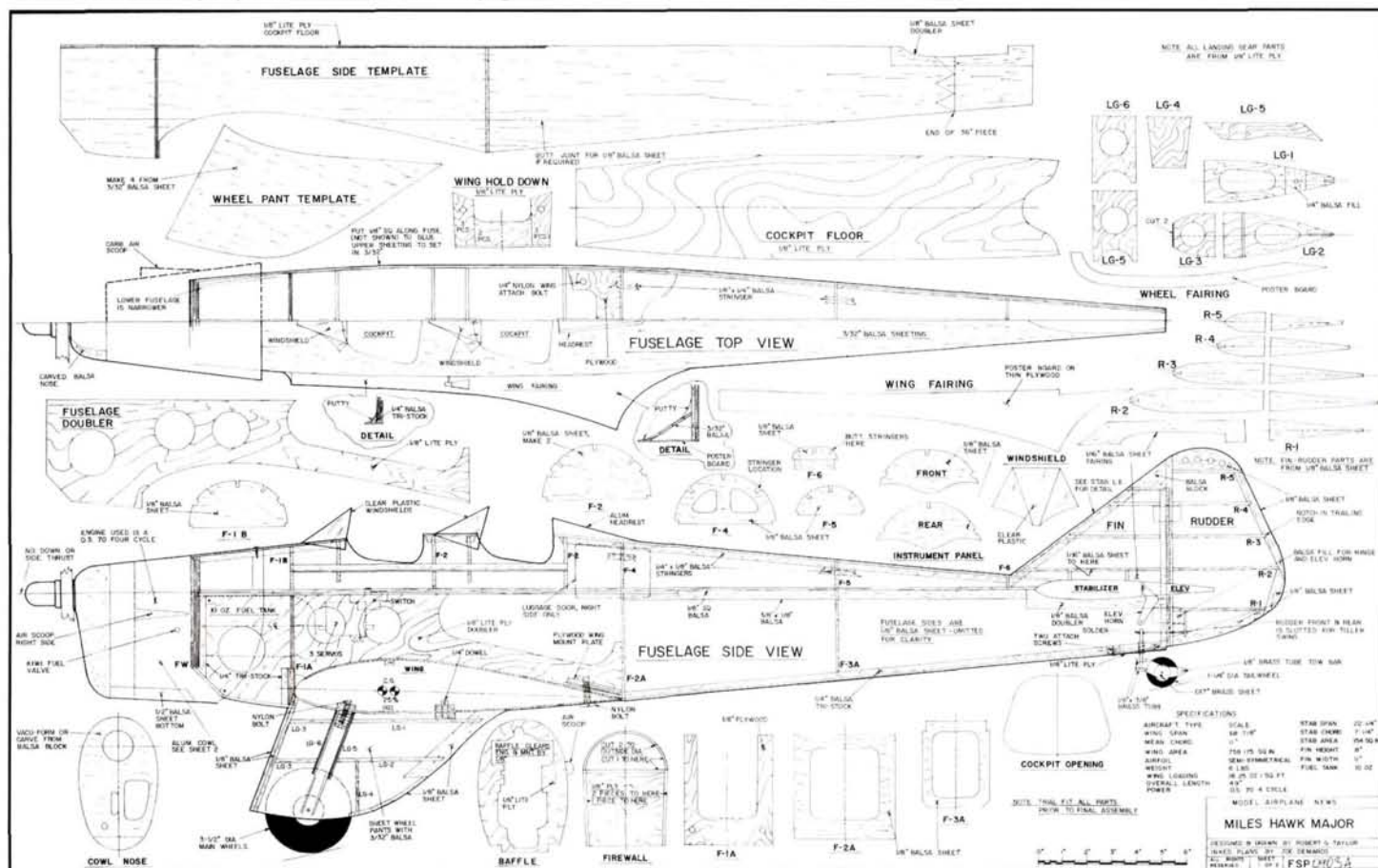
MAKING THE COWL

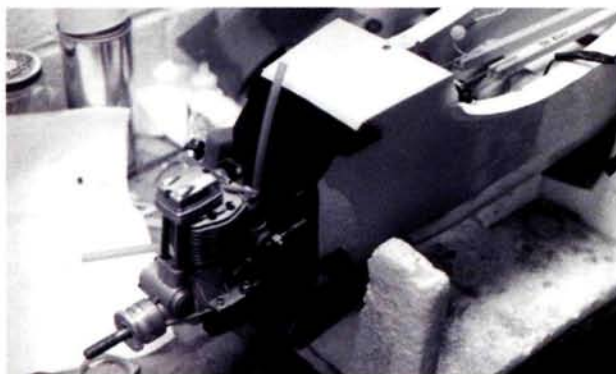
I shaped the front piece from a balsa block and cut the bottom piece from a 1/2-inch-thick piece of balsa. I hollowed out the front piece so it had an 1/8-inch-thick wall. I then glued the two pieces together at the correct angle to form the cowl outline. Using a template, I cut to shape some 0.010-inch-thick aluminum sheet (from the local newspaper print shop). I used ProBond to glue it to the nose blocks. (Sand the aluminum first.) I also installed a baffle so my engine would run cool, and I made a working air scoop on the right side; it's glued in place with ProBond.

FLIGHT PERFORMANCE

I had invested three months of work in this plane, so I was nervous when I went out to fly it. We started the engine and ran it up once, then taxied out. I fed in power and right rudder to keep it straight, and the model went on its way. The ol' Miles lifted off and went into the wild blue—stable as a rock. I never touched the trim! I took it up high and tested its slow-flight characteristics and steered it around with the rudder; it looked as though I

To order the full-size plan, turn to "RCStore.com" on page 150.





The engine installation. Note the angled lowered portion of the firewall.



Author Bob Taylor poses with his new Hawk Major. Pilot Choni Irvin on the right.

could park it up there. On the first try, it refused to spin, so I climbed back up to altitude and put in high ailerons rates; boy, did it spin then! Just release the controls, and it will stop spinning nicely. I also tried tight circles to the right and left to see whether it would snap out of the turns; it wouldn't. I gave the plane to Choni, and he really wrung it out. He liked the way it handled. It lands nicely, but you have to fly the model all the way to a stop. My Cub is that way. For anyone with some tail-dragger experience, the Miles Hawk Major should be a snap. Have fun! ✈

FSP0903A MILES HAWK MAJOR

Designed by Robert Taylor, the Miles Hawk Major is a simple scale design that's relatively easy to build. It uses traditional balsa and ply construction and has a one-piece wing. The wing is built in three sections (center and two outer panels) that are glued together to form the finished wing. The model has excellent flight characteristics and is fairly aerobatic.

Span 68 7/8 in.; length 49 in.; power .70 4-stroke; 2 sheets; LD: 2 \$21.95

Bob's Aircraft Documentation (714) 979-8058; bobsairdoc.com.

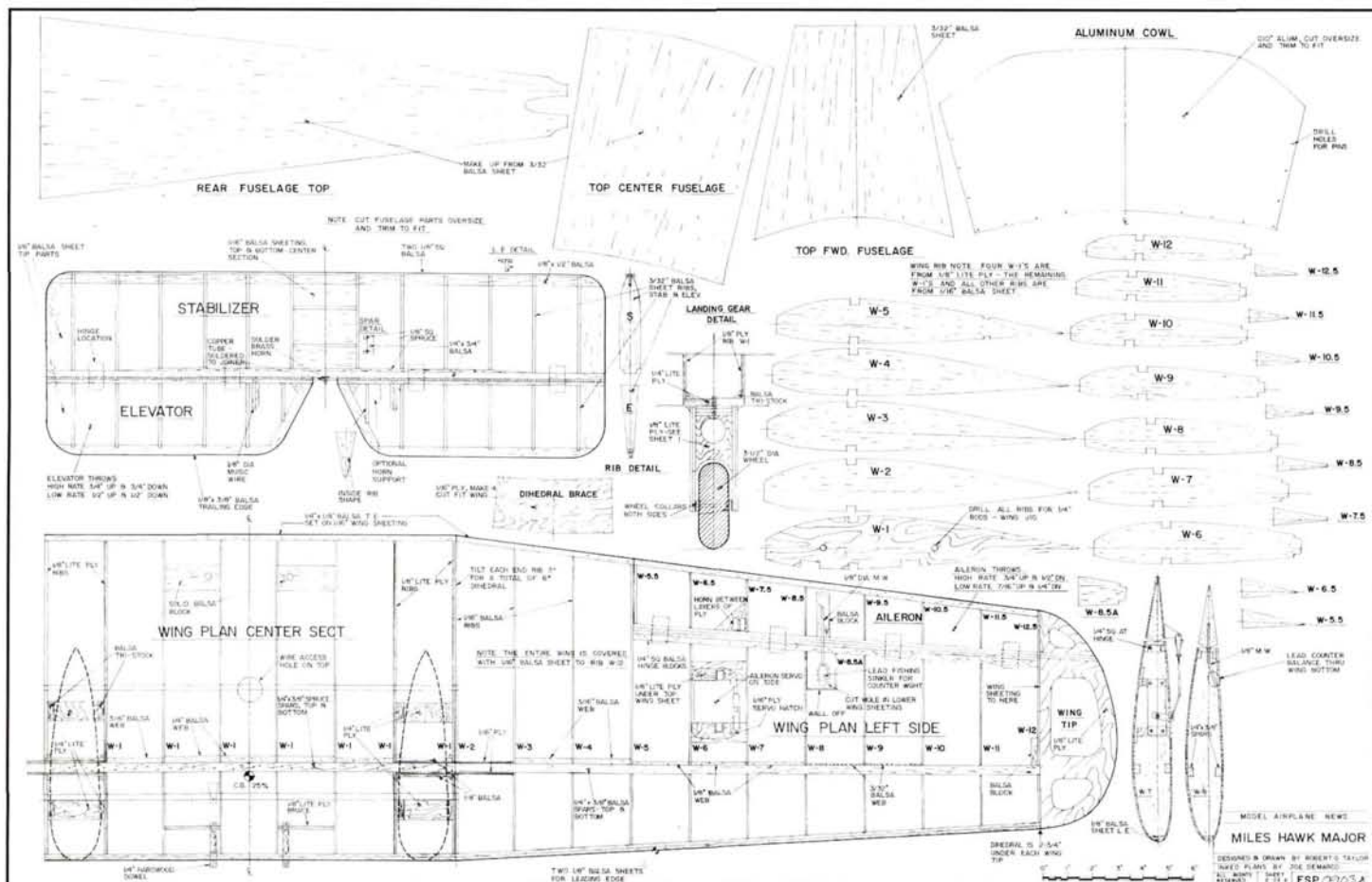
Great Planes Model Distributors Co. (800) 637-7660; greatplanes.com.

LustreKote; distributed by Great Planes.

MonoKote; distributed by Great Planes.

O.S.; distributed by Great Planes.

Zap; distributed by Pacer Technology; (800) 538-3091; pacertechnology.com.





There are many big props to choose from. I prefer wood to composite props, but that's a personal choice. Whichever type of prop you use, you have to balance it and make sure that it fits your engine's output shaft precisely.

Propeller tips

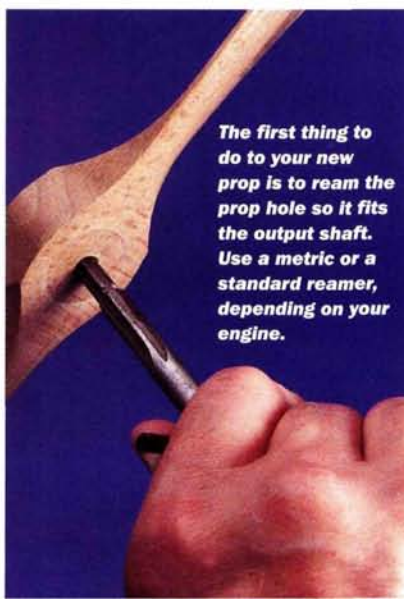
With so many propellers available from so many sources and with the seemingly countless variations of diameter and pitch values, there is virtually an unlimited supply of props to choose from. One of the most frequently asked questions I receive from "Thinking Big" readers is, "What prop should I use with my (fill in the brand name) engine?" This question seems pretty straightforward, but as we shall see, it's anything but! What should be asked is "Which prop should I use for my model?" Let's dig a little deeper.

To select the appropriate propeller, you have to take into account both your engine's power and your airframe's weight and structure. The prop requirement for a 1/8-scale Sopwith Pup is not necessarily the same as for a 1/8-scale AT-6 Texan even though both models might be powered by the same engine—a Zenoah G-62, for example. The Pup, with its rigging wires and two wings, has more drag to deal with, and because of its relatively light wing loading, it can fly at low airspeeds. In comparison, the Texan has retractable landing gear, a single wing and a higher

wing loading; it needs to be flown much faster than the Pup. It isn't likely that you would use the same prop for both planes.

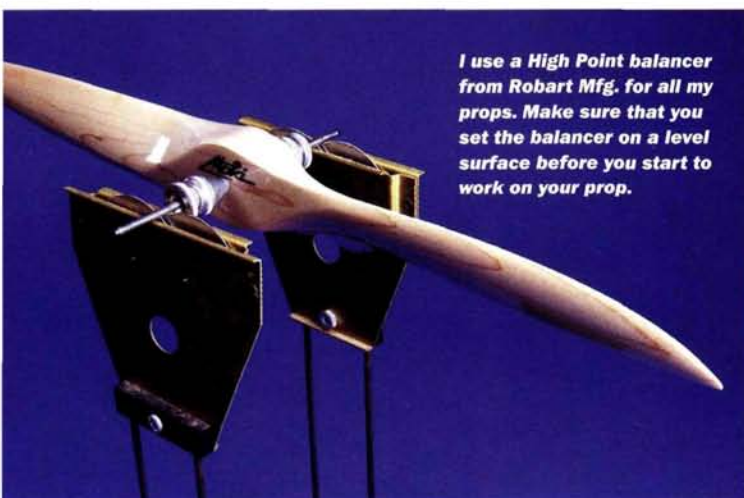
What you have to ask yourself is, "How do I want my model to perform?" With the Pup, you want good climb performance and a maximum airspeed of about 40 to 50mph. With the Texan, you want good climb performance, but you also want the model to fly somewhere in the 60 to 80mph range. Also, you want your prop to load the engine sufficiently for it to operate within its optimal power band. So the information needed to pick the correct prop boils down to the model's weight, wing loading and estimated airspeed and the engine's optimal rpm range.

With calculations by model aerodynamics guru Andy Lennon, Figure 1 will help you to estimate your model's top speed given its engine's static rpm and the prop's nominal pitch value. Use a ruler to connect the rpm (left column in chart on next page) to the pitch value (right column). The level flight speed in mph is then found in the center column. In a nutshell, a prop with a lower pitch is good for a slow, draggy Pup, and a higher pitch is good for the faster, higher-performance

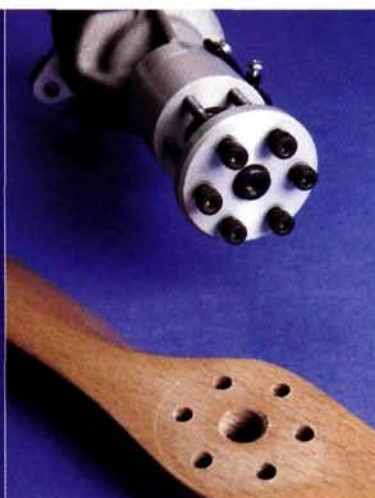


The first thing to do to your new prop is to ream the prop hole so it fits the output shaft. Use a metric or a standard reamer, depending on your engine.



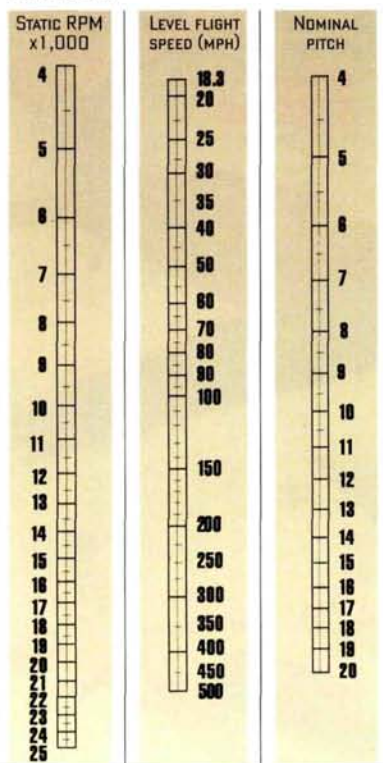


I use a High Point balancer from Robart Mfg. for all my props. Make sure that you set the balancer on a level surface before you start to work on your prop.



Left: for multi-bolt prop hubs such as on this ZDZ 40 engine, use a drill press to drill the bolt holes. Be sure to position the holes so that there is a clear path of wood from tip to tip.

FIGURE 1



Use this nomograph to estimate your model's top airspeed. Use a straightedge, and align the engine rpm value with the pitch of the prop you plan to use. The level-flight speed (in mph) is shown where the straightedge intersects the center column.

spanwise (Figure 2). You should also balance it chordwise or across the hub face. Placing the prop in a vertical position will show whether it needs further attention. Whichever way the top blade falls, that's the side of the hub that is heavy (Figure 3). The propeller is perfectly balanced when it can be placed in any position and remains there without moving at all.

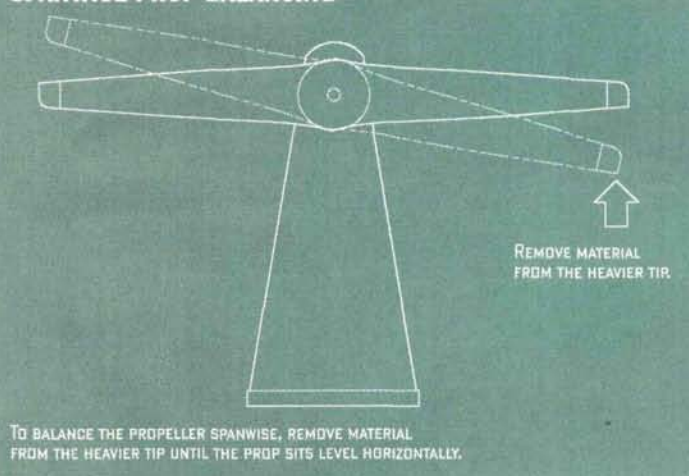
The first thing to do before balancing a prop is to ream the prop hole so it precisely fits your engine's output shaft. It makes little sense to balance the prop if the prop hole is too big or off-center. Don't use a drill bit to enlarge the hole; the bit could easily damage the prop. Use a prop reamer and do the job slowly by hand. Once the hole has been reamed to the proper size, slide the prop onto the

Texan. Of course, these are two extreme model examples, so the best way to find the optimum prop/engine/airframe combination is to test-fly your prop choices.

THE BALANCING ACT

It is very important to properly balance your propellers, especially with giant-scale models. An unbalanced prop causes unwanted vibration that can, over time, damage both the engine and the model's airframe. Use a good-quality prop balancer that's suitable for the size of prop you are balancing. I have used a High-Point balancer from Robart Mfg. for many years. At the very least, you should always balance your props so that they sit horizontally on the balancer's spindle. But this is only 50 percent of the job: the prop is balanced

FIGURE 2
SPANWISE PROP BALANCING



output shaft and see how the aft prop hub face sits against the engine's drive washer. It should sit flat against it. If it is off slightly, sand the hub's surface with a sanding block. If it is off by a lot, replace the prop altogether (Figure 4).

There are many ways to balance props, but I believe in the "Keep it simple, stupid" method. I simply remove material from the very tip of the heavier blade or from the heavier side of the prop hub until the blades balance. Many modelers sand the blades' front or rear surfaces, but this can change the prop's airfoil cross-section. This method also removes a lot of the prop's protective finish and can allow moisture to be absorbed by the sanded blade area. By removing material only at the very tip, I need only a small amount

FIGURE 3
CHORDWISE PROP BALANCING

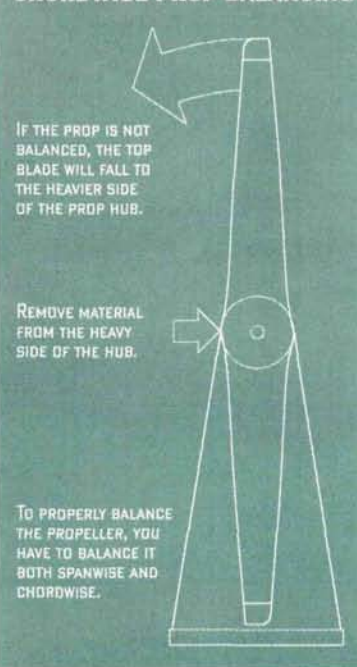
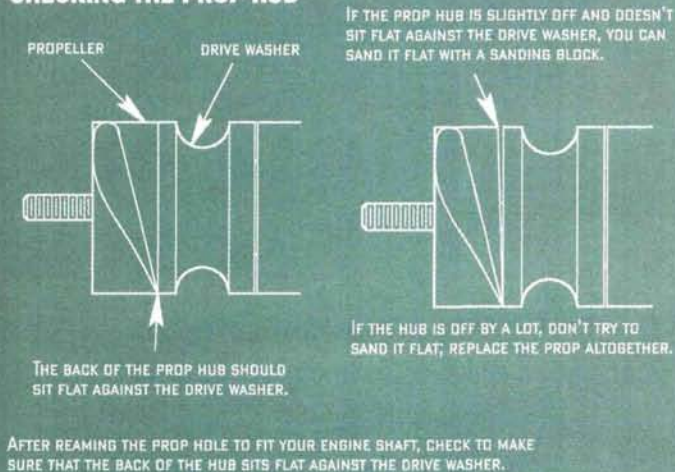


FIGURE 4
CHECKING THE PROP HUB



of paint or clear varnish to seal the exposed wood. You can also paint your props to improve their scale appearance and to further protect them from moisture. And while you're at it, paint those tips with a bright color so they'll be more easily seen when the engine is running.

Once you have balanced your props, store them lying flat in a horizontal position. Don't hang them in such a way that one blade is lower than the other. Over time, moisture will find its way to the lower prop and will ruin all your hard work.

MULTI-BOLT PROP HUBS

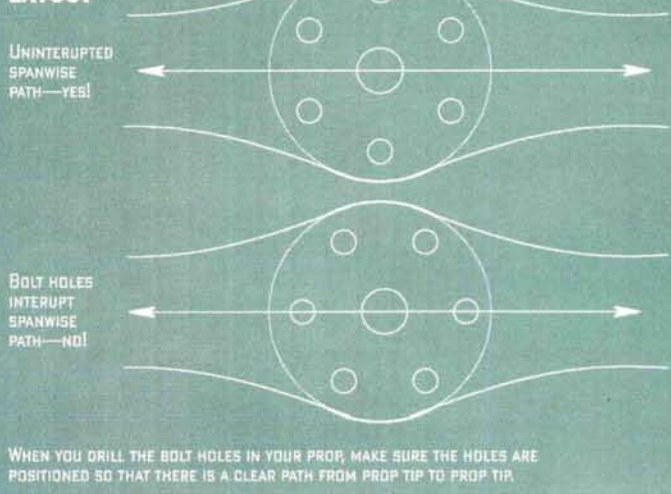
Several engines come with multi-bolt prop hubs in which there are six bolts around the central prop shaft. Don't try to drill these holes with a hand-held drill; use a drill press if you can, and use the prop washer as a guide while you drill the holes. The proper way to drill the bolt holes is to position them so that there is a

clear path from prop tip to prop tip (Figure 5).

Once you have drilled the holes, check their alignment by placing the prop on the engine and installing the bolts by hand. They should all thread easily into the drive washer. If they don't, enlarge the misaligned holes slightly so that the bolts fit easily. When you're satisfied with their fit, remove the prop back and balance the prop. To ensure that the prop is always attached in the same position on the shaft, make a pencil mark on the prop hub and the drive washer. Whether you use a single prop nut or a multi-bolt prop hub, always make sure the prop is securely attached to the engine. Make sure the prop bolts are tight, and always check the prop for damage before you go flying. When it comes to props, don't take any chances! ✦

Robart Mfg. (630) 584-7616; robart.com.

FIGURE 5
MULTI-BOLT PROP-HUB LAYOUT



B.H. HANSON ZENOAH G-26

Famous for his hopped-up Zenoah RC marine engines, Bruce Hanson now offers a hopped-up Zenoah G-26 model airplane engine. The B.H. Hanson 260 has an internally mounted electronic-ignition system from RC Ignitions. Bruce's new 260 is lighter than the stock G-26, and the ignition conversion does away with the magneto flywheel and coil. The ignition is sealed in the back part of the engine case between the engine and the engine mount. The rear end of the crankshaft has also been cut off, and an aluminum plate seals the rear of the case. The modified engine weighs 2.8 pounds, not including the muffler.

The ignition system makes starting a breeze and requires only 200mA at any rpm to operate. That's roughly 2½ hours on a small 4.8V, 500mAh pack. The engine comes with a muffler, a spark plug and a wrench, and it includes a socket and a removable RCA jack (RadioShack audio cable) to connect your battery pack (not included) to the engine.

The engine is timed to fire at 28 degrees (BTDC) at any rpm above 4,000. I am told that the engine produces about 3hp and peak torque at about 9,000rpm (no muffler). That's about the rpm you get while turning a Mejzlik 18x6 prop. The stock muffler brings the revs down to about 8,100.

At \$380, the B.H. Hanson 260 is a great value for the power and performance this little dynamo puts out!

B.H. Hanson (702) 436-4422; bhhanson.com.



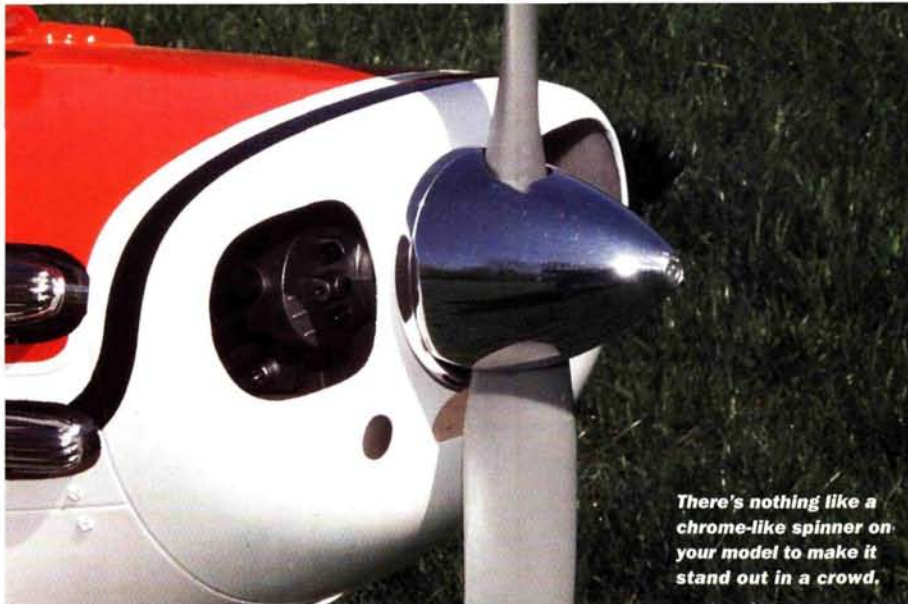
The ignition system is installed in the aft portion of the engine case. Note the magnetic pick-up installed in the prop-hub assembly.



The B.H. Hanson 260 is a modified Zenoah G-26 with an electronic ignition system.

Polish aluminum spinners

Bringing out the shine is easy by Rick Bell



There's nothing like a chrome-like spinner on your model to make it stand out in a crowd.

Like many modelers, I want to have a sharp-looking plane that stands out on the flightline. One detail that can really grab attention is a highly polished metal spinner that gleams and glints on a bright sunny day. Most metal spinners are made of turned aluminum that isn't shiny. Although they have a nice shape, these spinners just don't have the chrome-plated look that could set them apart from the crowd.

Polishing an aluminum spinner to bring out that shine isn't difficult. In fact, it's pretty easy and requires just a few, easy-to-find supplies. The most important item needed for this project is elbow grease—something that modelers have a lot of! For this article, I used a Tru-Turn 2½-inch-diameter aluminum spinner that saw a lot of flying last year. Why not follow along and learn how to add a touch of class to your airborne pride and joy?

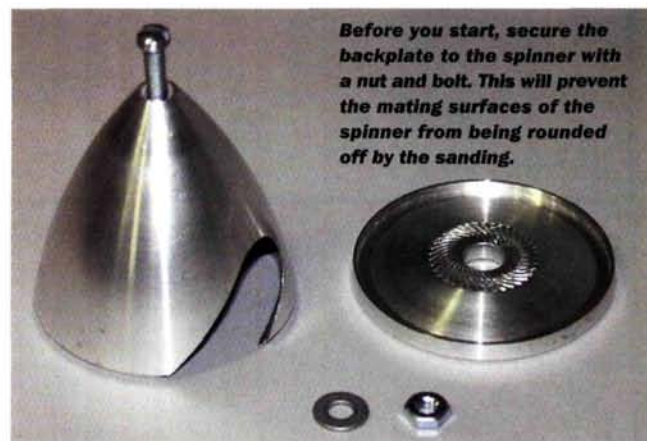


Here's all you need to bring out the shine in aluminum: sandpaper in several grits, metal polish, a Dremel tool and "elbow grease."

1 Although there are various ways to polish metal, the best way to polish turned aluminum is to sand the spinner with successively finer grits of wet-and-dry sandpaper used wet. You'll need sheets of 240-, 400-, 600- and 1,000-grit sandpaper; you can find them at any hardware store. To bring out the shine, you'll need a cream-based polishing compound and a Dremel Moto-Tool with a large, felt polishing wheel. I use Blue Magic metal polish; it's available at auto-parts stores. Just about any metal polish will do, so you don't need to buy an expensive brand; the cheap stuff works just fine.

One note of caution here: don't mount the spinner in a lathe, a drill press, or a hand drill to rotate the spinner. Those power tools would turn the spinner so fast that you could damage it or injure yourself.

2 Fasten the backplate to the spinner. Insert a long bolt through the spinner's nose and securely tighten a nut and washer to the rear of the backplate. It's best to grind down the bolt's head (if necessary) so it fits completely inside the recess. If you use an extra-long bolt, you'll have a convenient handle to hold the spinner.



Before you start, secure the backplate to the spinner with a nut and bolt. This will prevent the mating surfaces of the spinner from being rounded off by the sanding.

3 Start by sanding with the 240-grit sandpaper used wet. If you look closely at the spinner, you should see tiny radial grooves that encircle the spinner. The cutting tool that machines the spinner to shape creates



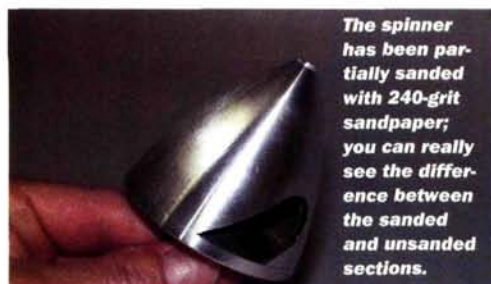
Start by sanding the spinner from its nose to back at 90 degrees to the tiny, machined-in radial grooves. Remember to keep the sandpaper wet.

these grooves. The grooves are similar to those on an old 33rpm record. The best way to remove them is to sand at 90 degrees across them—not parallel to them.

With a stroking motion and moderate pressure, manually sand the spinner from its nose to the backplate. Make sure

that the sandpaper is wet at all times, or it will "load up" with aluminum powder that will scratch the spinner. Your goal in this step is to smooth out the machining tool's marks.

As you sand, the spinner will develop a satin finish; uneven areas that need further sanding and sections that you may have missed will be obvious. When you've sanded out all of the tool marks, it's time to switch to finer, 400-grit sandpaper.



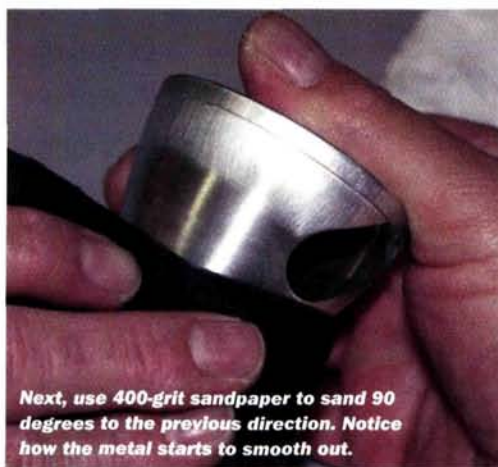
The spinner has been partially sanded with 240-grit sandpaper; you can really see the difference between the sanded and unsanded sections.



This is the spinner after the machining marks have been sanded out.

4 Sand the spinner as before, but this time, at 90 degrees to the previous direction; in other words, sand the circumference. Every time you move up to a finer-grit sandpaper, you must change the sanding direction by 90 degrees. As before, be sure to keep the sandpaper wet, and sand the spinner until all of the previous sanding marks are gone and the spinner takes on a nice burnished look.

Now, change to 600-grit paper and alternate the sanding direction; again, sand it until the previous marks have been smoothed out. The spinner is starting to look pretty good, but let's take the sanding one step further.



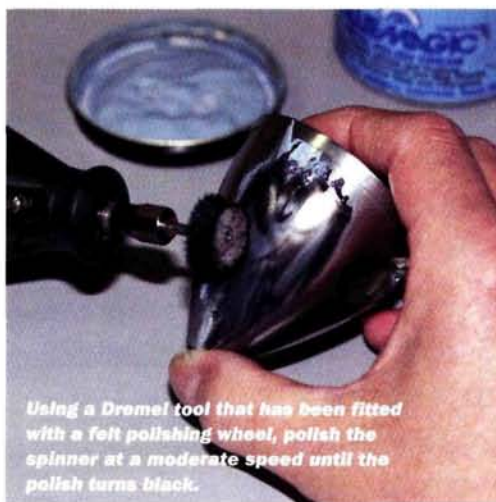
Next, use 400-grit sandpaper to sand 90 degrees to the previous direction. Notice how the metal starts to smooth out.



When finished with the 400-grit sandpaper, the spinner will have a nice, burnished look.



The spinner has been finish-sanded with 1000-grit sandpaper and is ready to be polished. Notice the fine satin look.



Using a Dremel tool that has been fitted with a felt polishing wheel, polish the spinner at a moderate speed until the polish turns black.

5 This last sanding with 1,000-grit sandpaper really smooths the metal, and it will begin to shine. Take your time to thoroughly sand the spinner to remove any remaining scratches. The better job you do with the sandpaper, the easier it will be to polish the spinner in the next step. You'll know you can move to the polishing step when it has a satiny look and feels very smooth.



It's hard to believe that this is the same spinner. Nice shine!

6 This is where the elbow grease you applied in the past few steps pays off. Use the Moto-Tool and a felt polishing wheel to apply the metal-polish to a small area of the spinner. Use the tool at its medium speed (if the speed is too high, you'll "burn" the polish) with moderate pressure. Polish the metal until it turns black; as it does, the polishing cream will start to disappear, and the metal will look like chrome. Polish the entire spinner. When you polish near the prop cutouts and at the backplate edges, be sure to run the polishing wheel parallel to the edges; if you don't, the wheel can grab the edges and dislodge the spinner from your grip.

When you are satisfied with the spinner's shine, use a clean cloth and glass cleaner to remove any polish residue. You'll be amazed at the results!

If you don't have a Dremel tool, you can polish the spinner by hand. It will take longer, but the results will be much the same. It takes me about 2 hours to polish a spinner of this size; larger spinners will take more time.

That's all there is to it! A little time and elbow grease will yield a spinner that looks as if it has been chrome-plated. But you don't need to tell your flying buddies that! ⚡

Tru-Turn; distributed by Romco Mfg.
(713) 943-1867; tru-turn.com.

by David Penchuck

Modify a Walbro carburetor

Adding a regulator vent smooths throttle response



PHOTOS BY DAVID PENCHUCK

Gas engines are at the heart of giant-scale models, and in most cases, they run without much effort. When a problem does arise, it might be a difference in pressure between the outside air and the air pressure within your cowl. Here's how to fix it!

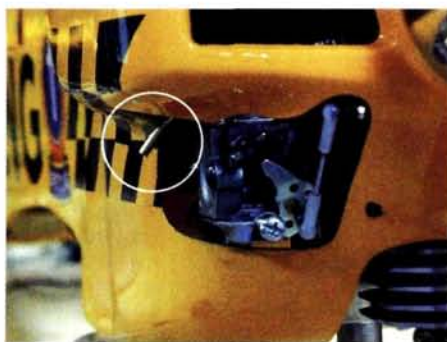
The Walbro carburetor is a marvelous invention that's largely responsible for the increased interest in gas engines in giant-scale aircraft. With its built-in pump and regulator, it can deliver fuel from your tank (no matter where the tank is located) and meter it perfectly to the engine every time. No matter if the weather is hot, cold, dry, or humid, the Walbro carb always seems to work, and you never have to adjust the needle valves. Even so, it's responsible for a delicate balance between monitoring atmospheric pressure and metering the fuel. Mix up any of the parameters, and the whole thing can easily get out of whack.

Despite the Walbro carb's reliability, you still might find yourself perplexed by a problem that defies all logic. Your engine runs great on the bench and in the plane, but in the air, your mixture settings go sour. Your plane takes off as expected, but on climb-out, the engine goes excessively rich. You land to adjust it, only to find that the engine now works perfectly again. Nevertheless, to solve the problem, you lean out the top end, but the transition is poor because the engine is now too lean on the ground.

WHAT'S WRONG?

When trying to solve an engine problem, you first need to know where to look. Is it the fuel pump or the regulator? If it's a pump problem, it usually manifests itself as follows: you try to start the engine, but nothing happens.

You prime it thoroughly, and it kicks or even runs for a few seconds, but that's it. If this is the case, you more than likely have a pump or fuel-delivery problem. I won't go into great detail on this point, but checking out the fuel system and monitoring for air bubbles in the fuel line would be a good start. If, however, you have an engine that runs fine on the ground but behaves poorly in the air, your



With the cowl in place, you can just see the brass vent tube sticking out of the left side. This vents the carb to outside air pressure—not the pressure within the cowl.

problem is probably with the regulator. If this sounds like your engine, here's what to do.

BASIC CARB TEARDOWN

You can tell which side of the carburetor does what by noting where the fuel fitting goes in. This is the pump side, and it's fastened by

one big screw in the middle of the cap. The big screw in the center is all that holds on the plate that covers the one-way valves and the pump diaphragm. Larger engines (4.2ci and higher) may use four screws to hold this cap, but the operation is still the same. The opposite side of the carburetor has a chrome-plated square with one small hole in it that serves as an atmospheric sensor port through which the diaphragm monitors static pressure; it doesn't have air flowing through it. That's the business end of the regulator.

Four screws hold the carb in place, so let's take a look at it. With the plate facing up so no parts fall out, go ahead and remove the screws. Without much effort, you can lift the plate off the rubber diaphragm that lies beneath it. Don't use a knife or a screwdriver; gaskets and diaphragms have delicate surfaces that are easily damaged. Tap the cover lightly with a screwdriver handle to break the cover free, and use your fingernail to pry the surfaces apart.

You have now reached the part that is usually the cause of regulator problems. The black rubber diaphragm with the rivet in the center measures atmospheric pressure and controls the lever and main needle valve below. You will notice a large washer on one side of the diaphragm; this is the inside (remember this when you reassemble the carb!), and it is the rivet that pushes on the little lever in the center of the carburetor



With the cowl removed, you can see the extension of the atmospheric pressure vent from the top of the carburetor. Test-fly with the cowl removed first to help prove that the problem is with the air pressure within the cowl.

body. You don't need to do any more dismantling unless you think you have a dirt problem, in which case you'll need the help of an expert. If you're feeling adventurous, proceed with caution, as the lever is spring-loaded and parts will surely want to escape.

With the diaphragm removed, you can push on the lever in the center of the carburetor

retor body to see how things work. The lever is connected to a main needle valve, and this is what meters the desired fuel pressure to the high- and low-speed jets. The rivet in the center pushes down on the lever, and this, in turn, lifts the main needle valve out of its seat. Fuel fills the cavity, and the venturi effect in the carb's throat pulls fuel into the airstream.

MECHANICAL PROBLEMS

If a faulty part is to blame, the guilty party is most likely the rubber diaphragm, and this usually occurs because of its age. If you carefully remove the chrome cover after you run the engine and find that the surface between the cover and the diaphragm is wet, you



The black-plastic fuel-inlet fitting indicates on which side of the carb the fuel pump is located. On most gas engines (up to 4.2ci), this cover is held on by only one big center screw.

have a problem. There should be no fuel here; even a pinhole leak will cause fuel-metering problems. The other, more common problem is that over time, the diaphragm may harden and will no longer respond to pressure changes. The simple solution to both of these problems is to replace the diaphragm. A carburetor kit contains all the parts you'll need and should be considered part of your routine airplane maintenance, just as new batteries are. Carburetor kits are available at hobby shops and small-engine shops, as these carbs are the same as those used in weed eaters and chain saws. If the diaphragm looks OK, the problem may not be parts-related at all.

INSTALLATION PROBLEMS

Now that you've inspected the carburetor and made certain that the problem isn't with your equipment, it's time to look at the carb's location and orientation. If the carburetor is completely inside or outside the cowl, problems are unlikely. But what if the intake is outside the cowl, and the regulator inlet is just on the edge of the cowl or inside of it? When the airstream of a moving plane rams air into the regulator opening and pushes on the



Remove the carb from the engine, and remove the regulator cover plate. Here, you can see the inner workings of the pressure regulator. Note that the small rivet in the black-rubber diaphragm should be facing outward, as shown here. Also note the small hole in the regulator cover; it vents the regulator and allows it to monitor static air pressure.



It's very easy to tell which side of the regulator diaphragm goes toward the carburetor. The large washer is the giveaway here; the rivet in the center of the washer is what pushes against the lever inside the regulator; it should face inward!



Here is a close-up of the regulator. The lever in the center pivots on the shaft and lifts the main needle valve on the left side. The valve regulates the amount of fuel that flows into the chamber.

diaphragm, the diaphragm, in turn, pushes on the lever and opens the main needle valve to raise the fuel pressure, thus allowing more fuel into the high- and low-speed jets and resulting in a rich engine. Conversely, if the regulator opening is in an area of turbulent airflow and the diaphragm is subject to a vacuum, the engine will tend to go lean.

Before we get to the serious work, here is a simple test: try to fly your plane with the cowl off. Make sure that you adjust for the change in CG, as this will make it more tail-heavy. If removing the cowl clears up the

problem, you'll know that airflow around the regulator is the answer. Try rotating the cover so the hole is relocated relative to the cowl opening; this may be a sufficient solution to the problem. If not, let's go on.

With a little work, you can extend the regulator's inlet so it's more to your liking. You'll have to modify the regulator cover, but don't worry about ruining it; this cover is common to most carburetors, and you can pick up another for a few dollars at a small-engine shop. Remove the cover, and drill an 1/8-inch hole in it. Use a short length of brass tube, and silver-solder the tube in the hole, but make sure that it doesn't protrude through the cover. You don't want it to touch the diaphragm when everything has been assembled. The tube's length should be enough to extend out-



The complete modification. Note the position of the vent tube; it faces straight out from the carb. This setup will fix most engine installations. My tube is bent to clear the large cheek cowl of my CAP 231. The important things are that the tube is long enough and is placed correctly to be vented to the outside air pressure.

side the cowl but not much more. This should equalize the pressure on the regulator and solve any rich or lean conditions during flight.

A straight tube will suffice in most cases, but in odd situations, you might have to resort to bending the tube, as shown in the photos of the Wolf 1.80 in my CAP 231. You can see that my carburetor inlet is in free air, but the regulator, which is at the top, is just at the front edge of the cowl. Extending the tube straight out only moved the regulator inlet to the cowl cheek. This situation is unique to the CAP, but it's easily solved. Don't try to extend the brass tube with Tygon or silicone tubing; it will flop around in the air and only give you more problems.

CONCLUSION

I hope that this look into one aspect of the Walbro carburetor gives you some insight into potential problems and how to solve them. Adding a regulator inlet tube is quite simple, and it will cure many airflow-related regulator problems. When set up properly, your carb should run trouble-free for years to come; you need not put up with a cranky engine. †

RCV58-CD

A bold new engine design

With rotating cylinders that drive props at half the crankshaft's speed, RCV engines have made a name for themselves in the modeling community. The RCV58-CD is the company's latest release, and its crankshaft, rather than a rotating cylinder, drives the prop. This allows the use of standard-size props, whereas the three original RCV engines required much larger-diameter props with double the pitch.

RCV engines are manufactured in England and are distributed in the U.S. by Wildcat Fuels Inc. "RCV" stands for "rotary cylinder valve," which is the main feature that sets these engines apart. The rotary valve replaces the valve-train components of a conventional poppet-valve, 4-stroke engine, so there are no valves that need periodic adjustments. The design avoids the rpm limitation of the conventional valve train, so the engines can use a wider range of prop sizes.

Mechanically, the RCV58-CD is similar to its predecessors but it's quite unusual when compared with conventional 4-strokes that have poppet valves (see the drawing). Its cylinder valve is built into the rotating cylinder, and a port aligns alternately with the intake, exhaust and glow plug at the correct time in the 4-stroke cycle. The large gear is attached to the cylinder base, and the small gear is attached to the crankshaft.

The manual is very well done; it includes sections on basic do's and don'ts; plug, fuel and prop selection; starting, break-in and installation; and care and maintenance. The RCV website's wealth of useful information includes a prop-selection chart, general specifications, diagrams and parts' lists with exploded-parts views (rcvengines.com).

MOUNTING

The manual includes a full-size diagram to help you plan installation. The carb is in the rear, as it is in most 4-strokes. The distance from the prop's centerline to the top of the engine is about 1/2 inch less than the average poppet-valve engine in this displacement range, so less of the engine protrudes from the cowl. The only other difference is that, because of the horizontally split crankcase, the bottoms of the mounting lugs are 3mm lower than the crankshaft and prop's centerline. This isn't a problem in new or un-cowled installations, but you should be aware of this if you're planning to replace a cowled engine with the

58-CD; it can affect whether the spinner lines up with the cowl.

BREAK-IN AND STARTING

Following the manual's instructions, I ran the engine on the test stand in 15-minute bursts for about 1 hour, with ample cooldown periods between runs. The lowest idle was about 2,400rpm without glow power. The idle rpm continued to improve during flight

tests—down to about 2,100rpm.

For break-in and prop rpm tests, I used RCV's recommended APC 11x6 prop and Wildcat 15-percent-nitro fuel (16-percent total oil, of which 20 percent is castor and 80 percent is synthetic). This engine starts from the front (previous RCV engines needed to be started from the back). When an electric starter was used, the engine fired up instantly every time.

BASIC OPERATION

The engine's carb is adjusted similarly to other 4-strokes' carbs, except this engine preferred a rather rich idle adjustment. I found that the

SPECIFICATIONS

ENGINE: RCV58-CD

MANUFACTURER:
RCV Engines Ltd.

DISTRIBUTOR: Wildcat Fuels

DISPLACEMENT: .58ci (9.5cc)

WARRANTY: 2 years

BORE: 0.945 in. (24mm)

STROKE: 0.827 in. (21mm)

PRACTICAL RPM RANGE: 2,100 to 12,000

THRUST: 4 to 6 lb. static (per RCV)

WEIGHT: 16.2 oz. w/out muffler, 20.9 oz. w/muffler

HEIGHT (CENTERLINE TO TOP): 2.68 in. (68mm)

WIDTH: 2.165 in. (55mm)

LENGTH (PROP DRIVER TO BACK OF CARB): 4.17 in. (106mm)

SHAFT DIAMETER: 1/4-28 UNF thread

FUEL CONSUMPTION: 0.6 oz./min.

PRICE: \$189

HITS

- Low-maintenance valve design.
- Low installed height.
- Broad rpm and prop range.
- Good idle and transition.
- Reversible carb.

MISSES

- None.



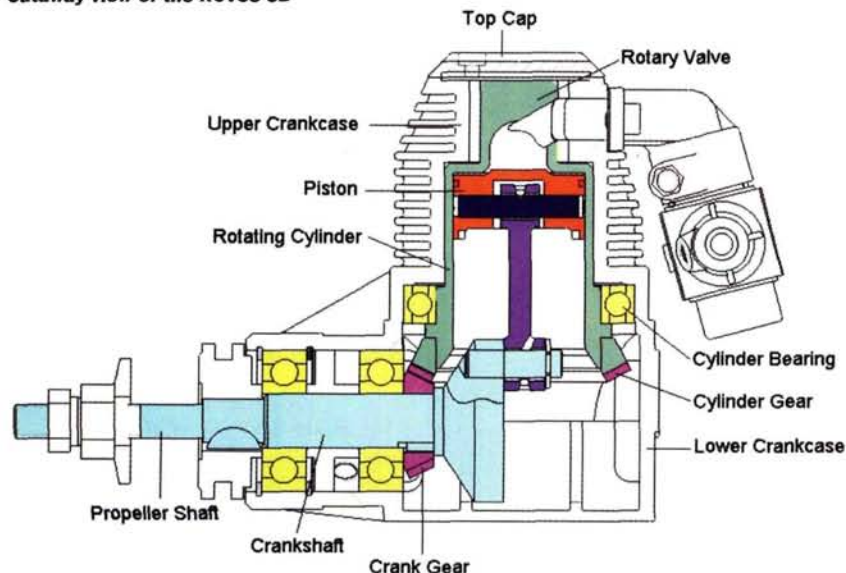
PROP PERFORMANCE

PROP	PEAK RPM	LOWEST IDLE RPM*
APC 11x6**	10,900	2,200
APC 11x7	10,200	2,300
APC 12x6	9,500	2,200
Master Airscrew 12x6	10,200	2,100

* Never fly at peak rpm: back off 200 to 300 on the rich side of peak for flight. After adjusting the low-speed mixture for the lowest possible idle, use the transmitter trim to raise the idle rpm 200 to 300.

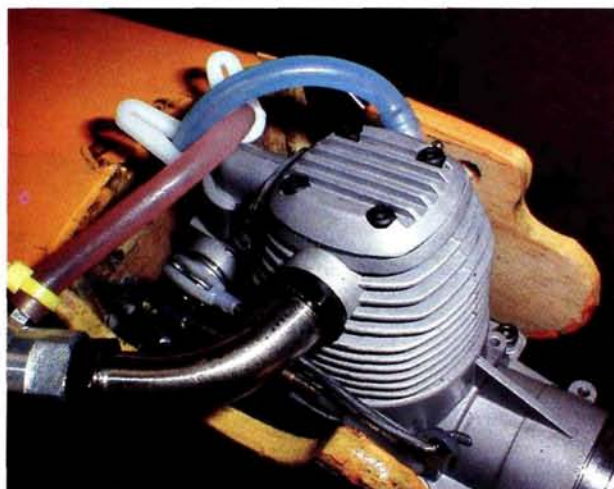
** This prop recommended by RCV for general use. Other RCV suggested props: 10x9, 10x10, 11x8, 12x7.

Cutaway view of the RCV58-CD

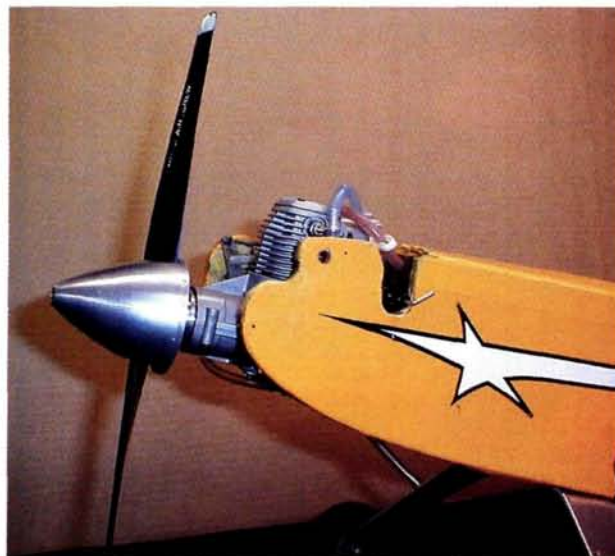


adjustment was just right when there was a 500rpm drop (2,900 down to 2,400) when I removed the glow igniter. The idle doesn't need an onboard glow system to be reliable, and I didn't use or need one in my test-flying. The manual covers carb adjustment in great detail and gives a good review of the basic methods used on all 4-strokes. The high-speed needle was very broad (insensitive), and that may be a clue that the diameter of the carb's throat is a bit too large. This is often done to maximize power at the expense of fuel draw strength; however, I didn't experience any problems related to fuel draw during my flight tests.

The 58-CD sounds slightly different from a standard 4-stroke; it has a weak, but noticeable, gear noise. The engine has built-in gear backlash clearance. At the field, I measured the sound level at about 90db (9 feet from the exhaust



The RCV58-CD fits nicely in the test plane; the author used an articulated throttle linkage to manage the carburetor placement.



The Sig Four-Star 40 served as the test plane. It performed well with both the Master Airscrew 12x6 (shown) and the APC 11x7.

side with an APC 11x7 turning about 10,000rpm); this is quite acceptable.

TEST FLIGHTS

Running an engine on a test stand is great for break-in, but what better way to get acquainted with a new engine than to install and fly it in a favorite plane? My well-worn Sig Four-Star 40 serves well in this role.

With the 58-CD installed, the plane performed well; aerobatics, including inverted and knife-edge, were easy. Vertical maneuvers were OK, but prolonged hovering was not possible. Touch-and-go's were fun because of the reliability of the 58-CD. That's saying something because I tried a great variety of props! My favorite props were the APC and Master Airscrew 12x6; they had the best idle—about 2,200rpm. In fact, the Master Airscrew (2,100rpm) gave nice steep approaches because the prop had a braking effect! The APC 11x7 gave the best top speed.

The manual recommends the use of fuel that contains 10 percent nitro and at least 15 percent oil. Of the total oil content, no more than 6 percent should be castor oil. RCV doesn't recommend a special break-in fuel.

In my test runs, I used fuels ranging from 5 to 30 percent nitro and found the engine was not sensitive to various blends and brands. It responded as any conventional 4-stroke engine might: a greater nitro content produced slightly more power but also a higher fuel-consumption rate.

In-flight fuel consumption appeared to be quite low at about 0.6 ounce per minute on an average flight with a typical distribution of throttle settings and with touch-and-go's. I got about 13 minutes from an 8-ounce tank with a small reserve; I set my flight timer for 12 minutes and always landed with fuel remaining.

CONCLUSION

The RCV58-CD is appropriate for any sport, scale, or fun-fly airplane that needs a .35 to .46 2-stroke or a .40 to .65 4-stroke. Overall, it's about 1/2 inch shorter than the average 4-stroke, so it's a natural choice for tightly fitting, scale cowls.

Overall, the 58-CD has adequate power for its displacement, it idles and throttles well, is very reliable in flight, has good handling characteristics and a competitive price. It also offers the potential of low maintenance as a bonus! The slight gear sound blends nicely with the 4-stroke exhaust note—different enough to turn heads at the field! This engine surely represents a bold new concept in sport-plane nitro power. ✦

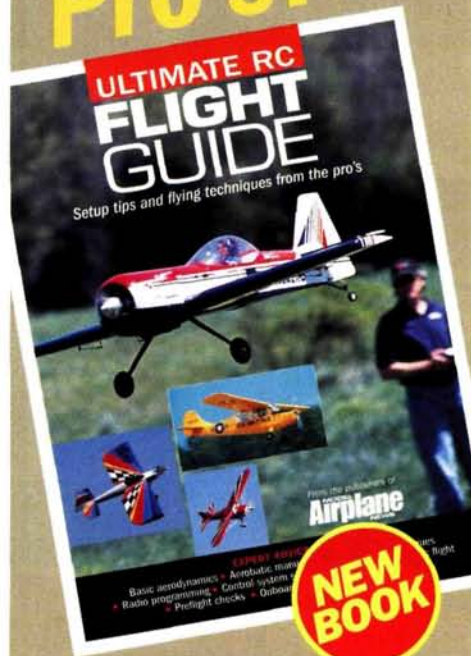
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Ron Ogren of Orchard Park, NY takes home top prize for correctly identifying July's mystery plane as the Piper PA-6 Sky Sedan. One of several experimental aircraft built by the Piper Co. following WW II, the Sky Sedan was to be the perfect family plane. Quite the departure from the well-known Cub series, this 4-place experimental sport plane represented Piper's initial entrance into the larger, all-metal-aircraft field. It featured a cantilever wing with trailing-edge flaps, electric, retractable landing gear and dual controls. Powered by a 165hp Continental E-165 engine, the 34-foot, 8-inch wingspan plane had a range of 500 miles. Unfortunately, a decline in the market forced the cancellation of the project, and only one Sky Sedan was ever produced. ✚



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Cermark QE Iron On-the-go heat

Has this ever happened to you? You're having a grand old time flying, but you misjudge a landing and end up in the tall weeds. You retrieve your plane and find that the weeds have torn a hole in the wing's covering. The puncture is too large to repair with a piece of tape, and you're too far from home—and from your workshop—to iron on a patch of covering for a proper repair. So you decide to pack it in for the day and head home. If you had Cermark's QE (Quick & Easy) Iron, you could easily repair your model's covering and continue flying.

This neat tool is a mini covering iron that's powered by a 12V power source such as your power panel. The battery must be able to supply 5 or more amps for proper heating. The iron comes with two alligator clips, and the wire lead is about 50 inches long. The temperature can be adjusted by means of a control knob from a low of 275 degrees to about 450 degrees—more than enough heat to affix any covering material. A blinking LED tells you when the iron has reached the selected temperature.

A couple of weekends ago, I had a chance to test the QE Iron on a friend's model; the wing had sustained a tear in the covering that was too large for a temporary repair with tape. We plugged the iron into a power panel and cut a patch out of a piece of scrap Ultracote. Within a minute or so, the blinking LED indicated that the QE Iron had heated up sufficiently, and we tacked the patch into place. Then we increased the iron's temp and shrank the patch tight. This was definitely too cool for words! The QE Iron is available from Cermark for only \$29.95. Don't go to the field without one; it could save your day! —Rick Bell

Cermark (800) 704-6229; cermark.com.



TreeTop Electronics TTE100 Peak-detect charger with computer control

This peak-detect charger is capable of charging 4 to 8 Ni-Cd or NiMH cells at an adjustable current of from 120 up to 1000mA (1 amp). You'll notice that in the photo, the TTE100 has a current-adjust knob but no meter. That's because this unit was designed to be used with a PC! The provided interface cable plugs into the parallel (printer) port on the back of your PC, and the provided CD contains the software required to operate it. The charger is powered by a wall unit that delivers 18 volts at approximately 1 amp.



The unique software created by TreeTop Electronics allows you to keep track of individual battery packs by file name as well as to store battery-pack history. You set the current levels using the PC. You can even customize the peak-detect voltage for each pack. The TTE100 doesn't have discharge capabilities, and that would have been a nice feature to use with a computer interface.

To use the TTE100, you'll need a PC with an Intel Pentium processor or equivalent; Windows 98, NT, 2000, or XP operating system; a parallel port; and 10MB of hard-drive space. The entire package of charger, software disc, computer-interface cable and the 120V wall-plug power supply sells for just under \$100.

For those modelers who enjoy using a PC and like to keep track of their various battery packs, this could prove to be a helpful organizing tool. —Bob Aberle

TreeTop Electronics (650) 773-1556; treetopelectronics.com.

Mr. Carbon

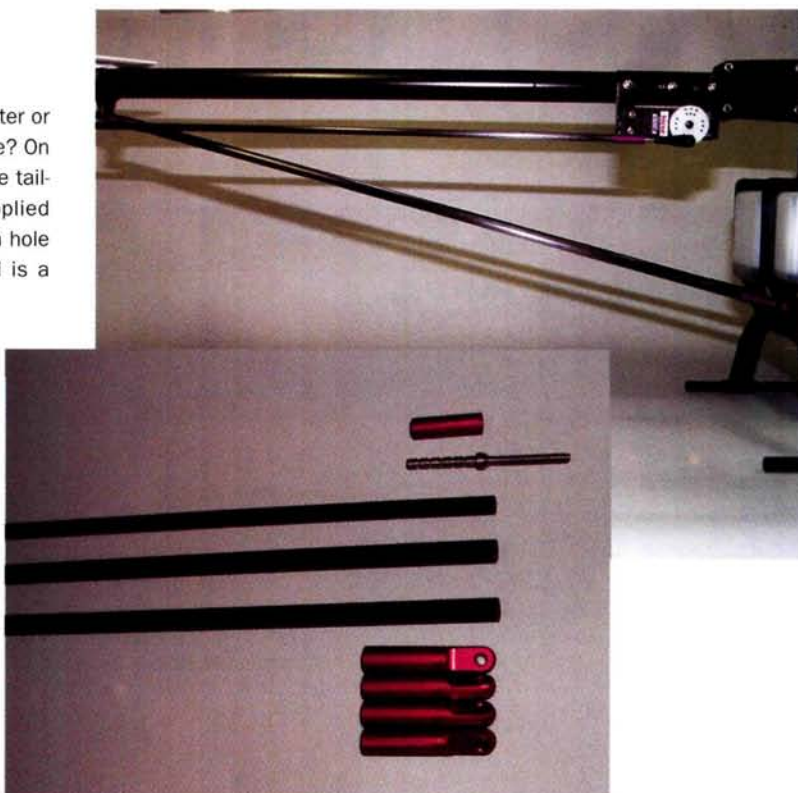
Carbon-fiber supports and pushrods Stylish upgrades for your heli

Have you ever needed to replace some parts on your favorite helicopter or just wanted to add a few low-cost upgrades for improved performance? On some helis, two areas that could benefit from being upgraded are the tail-boom supports and the tail-rotor pushrod. Some of the kit-supplied supports are just aluminum tubes with their ends pinched flat and a hole for the mounting bolt drilled through the ends, while the pushrod is a piece of music wire. Over time, vibration can cause both of these items to suffer from fatigue and then fail—with disastrous results. Rather than replacing these parts with the same stuff that could crack again, why not replace them with something a lot more durable?

Mr. Carbon has the answer: its new carbon tubes and machined-aluminum and titanium tips. The carbon rods are of a universal length that can be cut to fit any .30- to .90-size helicopter. The anodized metal tips come in cool colors, including blue, purple, black, silver, red and gold.

I recently replaced the boom supports and tail-rotor pushrod on my heli, and it took me only a few minutes to do so. I first measured and cut the rods to the required length, roughened their ends for a secure glue bond and then used JB Weld to attach the metal tips to the rods. After the glue had cured, it was a simple matter to bolt on the supports and attach the pushrod to the heli. When I flew the heli, there was a noticeable improvement in its performance; it felt a lot tighter and had snappier tail response—not bad for a few minutes of work! The boom-support kit costs \$20, and the pushrod kit costs \$15. Both kits include the metal tips, and the tail-rotor pushrod kit also includes threaded couplers and ball links. They make a strong and stylish addition to your heli. —Erick Royer

Mr. Carbon (650) 654-9689; mrcarbon.com.



Model Machining Service Mini Demon & Inner Demon Adjustable gearboxes

Model Machining Service has proven its expertise in machining with its most recent offerings. The Mini Demon and Inner Demon gearboxes are not only versatile, but they're also beautifully machined. One of their biggest benefits is that you can go to a local hobby shop and buy pinion gears right off the shelf. You can change the ratio of the Mini Demon box from 3.5:1 to 7.5:1 in minutes. The same goes for its bigger brother the Inner Demon, but the ratios range from 3.3:1 to 8.3:1.

If you've struggled with how to mount electric motors, these boxes have the solution. Each has an "EZ Mount" system that allows you to bolt it directly to the firewall.

The gearboxes also support single or dual motors ganged to a single prop. For as long as I can remember, folks have argued about whether ganging motors works, but all agree that if you do it, you must be sure to match the motors by properly timing them.

For my tests, I ganged two Kyosho Endoplasma motors on the

Inner Demon gearbox and geared them 6.6:1. On 20 cells, they turn an APC-E 17x10 prop at 5,400rpm to provide more than enough power to hoist my 8.5-pound Dymond Modelsports Ford Flivver skyward.

I used a single, 6V, Speed 400 motor on 8 cells and the Mini Demon gearbox geared at 4:1 to power a Northeast Sailplane Virus 400A. I was able to change the gear ratio and remount the system in a matter of minutes.

The Mini and Inner Demon gearboxes weigh 82 and 231 grams, respectively, so you need to plan accordingly, but they are extremely well made and sturdy. Their weight wasn't a factor in the models I tried them in. The Mini Demon costs \$69; the Inner Demon costs \$84. —Greg Gimlick

Model Machining Service (949) 631-2982; innerdemon.com.

FINAL APPROACH

BY MATT KEENNON

This 6-ounce Hornet is the first aircraft to fly using only the power of a fuel cell; it was produced by AeroVironment under a grant from DARPA.



First fuel-cell flight

The first true, fuel-cell powered RC airplane has at last flown! After years of anticipation, a new age of electric propulsion has begun. On March 21, 2003, I was fortunate enough to pilot the Hornet—a small, hydrogen-powered micro air vehicle (MAV)—for the record-setting flight as part of my work at AeroVironment Inc. in Simi Valley, CA. Fuel cells have flown on board vehicles for decades, from the Gemini space capsule to the contemporary space shuttle, but the Hornet MAV is the first to propel itself using only the power of a hydrogen fuel cell. The 15-inch-span Hornet looks like a small RC electric flying wing and has one electric motor, a receiver and microservos—not very different from a backyard flyer you might find at a hobby shop. The aircraft weighs only 6 ounces completely fueled.

On the top of the wing surface is an array of black panels that looks like solar cells but is, in fact, the fuel cell. A typical “cell” produces about 0.5 volt and can be wired in series or in parallel for more current or more voltage. The fuel cell is an energy-conversion device; it generates electricity by absorbing oxygen from the air flowing over its top while absorbing hydrogen gas from its inside surfaces. Hydrogen is stored on board in a dry, solid-pellet form, and it’s supplied by a unique generator system. When the hydrogen is released and combined with water, which the vehicle also carries, electricity and more water are produced.

The vehicle’s radio system, servos, motor pumps and other devices are all powered by the fuel cell. The fuel cell itself is surrounded by a stiff metal mesh that also stiffens and strengthens the wing. The fuel cell’s average power output during the groundbreaking flight was more than 10 watts. The aircraft didn’t carry any batteries or capacitors.

The fuel cell and its hydrogen generator have the potential to

achieve a system-specific energy of 400 watt-hours per kilogram. In comparison, lithium-polymer cells provide about 190 watt hours per kilogram. This is a power source that runs twice as long as a Li-poly for the same weight!

Lynntech Inc. of College Station, TX, developed the amazing little fuel cell and its novel solid-hydrogen fuel-storage system and contracted AeroVironment to develop and fly an aircraft using the fuel cell. I served as program manager and lead engineer for the AeroVironment team. Our objective was to explore the potential for improvement in the flight endurance of unmanned reconnaissance airplanes such as those used in the Iraq conflict.

The Hornet development program was funded by the U.S. government through the Defense Advanced Research Project Agency (DARPA), which has funded many amazing programs. The Hornet made three flights; its longest was 6 minutes, but it carried enough fuel for a much longer endurance flight.

AeroVironment also developed the DARPA-funded Wasp MAV, which achieved a record-setting 107-minute flight using lithium batteries in August 2002. Its design combines separate battery and wing-structure components with a multifunctional structure/battery-material system that supplies electrical energy for propulsion while carrying mechanical and aerodynamic wing loads. (The battery supplies energy and also functions as the wing so the plane can fly.) The 13-inch-span Wasp weighs just 6 ounces and uses off-the-shelf components and custom lithium-ion batteries that produce a higher energy density than any rechargeable battery system. Its energy density was 14 watts per kilogram, and during the flight, its average output was more than 9 watts.

For more information on the Hornet and Wasp aircraft, visit darpa.mil/body/news.html. Because DARPA operates under the federal government, your tax dollars are being used to develop the most amazing little RC aircraft in the world! ✦